



ONDO PIZZOFALCONE



NAZIONALE

B. Prov.

XIV

454

NAPOLI

BIBLIOTECA

VITT. EM. III

BIBLIOTECA PROVINCIALE



Armadio

XXVI

Num.° d'ordine

Palchetto

132/13

~~18 A 17~~



B. P. P. P.

XIV

454

COMMUNICATION
BETWEEN
THE ATLANTIC AND PACIFIC OCEANS
THROUGH THE
ISTHMUS OF TEHUANTEPEC.



645 0159

SURVEY

OF THE



ISTHMUS OF TEHUANTEPEC,

EXECUTED IN THE YEARS 1842 AND 1843,

WITH THE INTENT OF

ESTABLISHING A COMMUNICATION

BETWEEN

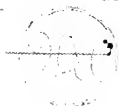
THE ATLANTIC AND PACIFIC OCEANS,

AND UNDER

THE SUPERINTENDENCE OF A SCIENTIFIC COMMISSION,

APPOINTED BY THE PROJECTOR

DON JOSÉ DE GARAY.



LONDON:



ACKERMANN AND CO., 96, STRAND.

1844.

LONDON :

PRINTED BY C. WOOD & CO., POPPIN'S COURT, FLEET STREET.

ERRATA.

Page 41	line 21	... <i>for</i> 17°	<i>read</i> 18°
47	23	... Coachapa	Coahuapa
60	32	... rapids	torrent streams
62	4	... dioretic	dioritic
110	29	... hides.	wool.
114	34	... they	the best
115	25	... the ..	its



SURVEY

OF THE

ISTHMUS OF TEHUANTEPEC.

INTRODUCTION.

THE project of a communication between the Atlantic and Pacific Oceans, which has been the object of scientific investigation ever since the discovery of America, attracted also the attention of the Spanish Government during the period that a great portion of that country formed an integral part of the monarchy.

The Cortes, having in view all that had been written upon this subject, and the various reports presented by persons charged with the surveys of the principal points suggested for the communication, and having taken into consideration the opinion of the Regency of the kingdom, by a decree of the 30th April 1814, authorised the opening of a canal across the isthmus of Tehuantepec, declaring that this enterprise should be carried into effect with the funds of the Consulate of Guadalajara.

This election, which evinces the preference given by the Spanish Government to the isthmus of Tehuantepec over those of Nicaragua and Panama, was overlooked in the various projects which have been set on foot since the Independence, and what is still more strange, was also neglected by the government of Mexico, the most directly interested party, no doubt from the distraction of political contests engrossing all other thoughts, and preventing the realization of every grand enterprise of this description.

In the year 1842, however, a government having been constituted with full and extraordinary powers, propositions were submitted to it by Don Joseph de Garay for the opening of a communication over the isthmus.

These propositions were declared to be accepted by a decree of the 1st of March of the same year, and on the following day an edict was published, proclaiming that on such communication being effected, the transit should be open to all nations, and the entire passage considered neutral territory.

This decree concedes to Mr. Garay the exclusive privilege of executing the work; and as a remuneration grants him the establishment of the means of transport, with the right of tolls for fifty years, and the proprietorship of the waste lands, comprising a surface of upwards of thirty miles on either side of the line of communication. It further authorises, with ample privileges, the settling of colonies within fifty leagues on both sides of the line; adding also in the same, as well as subsequent decrees, many other concessions of importance. (See Appendix).

Mr. Garay being bound to make surveys at his expense, previously to the execution of the work, named the following scientific gentlemen Commissioners for that purpose, viz:—

Director.

Signor Gaetano Moro.

Engineers.

Lieutenant-Colonel De La Trouplinière.

Captain Gonzalez, of the Staff Corps.

Secretary and Treasurer.

Don Pedro Garay, First Officer of the Ministry of War.

Assistant.

Don Mauro Guido, Lieutenant of the Navy.

This Commission set out for Tehuantepec on the 30th April of the same year amply provided with every thing requisite, and its labours form the subject of the following Memoir.

REPORT OF THE SURVEY
OF
THE ISTHMUS OF TEHUANTEPEC,
EXECUTED IN THE YEARS 1842 AND 1843,
Under the direction of the Engineer,
SIGNOR GAETANO MORO.

ON accepting the direction of the scientific commission with which I have had the honour to be entrusted, one of the first points to which I directed my attention was the investigation of all the former data upon the subject.

With the celebrated Hernando Cortes originated the idea of a communication by this isthmus between the two oceans. Its topographical advantages evidently did not escape the perspicacity of that extraordinary man; for it cannot be explained why, in the midst of a country in general so prodigiously fertile, he should have chosen for his own domain the only portion of it comparatively unproductive, unless he clearly saw that any mode of communication to be hereafter carried into effect must necessarily be executed over this ground. Nevertheless I am not of opinion that Cortes contemplated the opening of a canal, for although it is observed in the work of Lorenzana, that "Cortes had studied mathematics," and that for more than a century the construction of locks had been practised in Italy, still their use was but of limited application, and on so small a scale that it is not probable they had much

engaged the attention of Cortes. Further, to have ascertained the possibility of such a project could not have been effected otherwise than by carrying on operations, which the vast engagements of Cortes would not have allowed him personally to superintend, and I much doubt whether any one of his companions possessed the requisite knowledge for this undertaking; and, lastly, had he ever entertained such an idea, he would not have omitted to have made it known by asking the requisite grants and privileges from the Emperor, in the same manner as he obtained the rights over *all still and running waters* (of little use for this purpose) within the territory of Las Marquesanas, as appears from the title-deeds of these possessions conceded to him in the isthmus.

It appears to have been an object of intense interest with Cortes to discover some strait which might naturally unite the two seas, for, in his fourth letter to Charles V, he informs him of having directed an expedition to proceed to Guatemala, "because," he says, "I have received information as well of the great riches of that country, as that in the opinion of many navigators there exists a strait leading from that bay into the opposite sea, which is the thing above all others in this world I am desirous of meeting with, on account of the immense utility which I am convinced would result from it to the advantage of your Imperial Majesty." In the outset he was encouraged by brilliant expectations, and he announced that he had already directed several vessels "to run along the Bay of Ascension in search of the strait, which it was supposed was to be there found."

Cortes received daily information of the existence of new countries (the Californias), which no doubt appeared in vivid colours to the heated imaginations of these men, already so excited with the unexpected and prodigious

discovery of a new world ; nor is it to be wondered at, that with the imperfect notions then entertained of the configuration of the earth, Cortes himself should have been persuaded that these new regions which were announced to him, extended as far as Asia ; for, speaking of the difficulties he met with in constructing four vessels in the South Sea, he says, " I cannot describe how much I have
 " at heart the possession of these ships, because I feel
 " assured, with them and the Divine pleasure, I shall be
 " the cause of your Majesty being in these regions lord of
 " more kingdoms than are as yet known by our nation to
 " have existence ; and may it so please Him to appoint
 " that your Imperial Majesty may obtain so great a blessing, because I firmly believe, that by what I have now
 " ordered to be done, your Highness will require nothing
 " more to be *the monarch of the world.*"

In the meanwhile the hopes of finding the strait were waning, and therefore the isthmus necessarily acquired greater and new importance in the eyes of Cortes. It was now, in my opinion, that he conceived the idea of a lucrative speculation by means of a road over the isthmus, to supply Spain with the spices of the East Indies and the products of such new regions as he expected to discover. The following paragraphs of the above quoted letter, in which he expresses his wish to obtain a patent for this trade, and the artful manner he employs to attain it, appear to me clearly demonstrative of his object :

" In the preceding chapters I have informed you, O
 " most puissant lord, of the countries to which I have
 " dispatched persons both by land and sea, by which
 " means, under the guidance of heaven, I believe your
 " Majesty will be greatly served ; and as I am ever
 " desirous, so am I continually intent upon using every
 " means to put into execution, and carry out my wishes

“for the advancement of the service of your Majesty;
 “and seeing, on the other hand, that nothing more re-
 “mained for this object than to discover the secrets of
 “the coast still unexplored between the river Panuco
 “and Florida towards the north, as far as the Bacal-
 “laos, because it is asserted that in that coast there is
 “a strait which passes into the South Sea; and should
 “this be found in accordance with the information I
 “possess of the situation where the Archipelago, which
 “Magallan discovered by command of your highness,
 “is to be found, it would then happen, should we, with
 “the Divine assistance, so hit upon this strait, that the
 “navigation from the Spice countries (the East Indies)
 “to the kingdoms of your Majesty would become ex-
 “cellent and shorter, so much so that it would be two-
 “thirds less than the present navigation, and without any
 “danger or risk to the ships in going and coming, because
 “they would always make the passage through kingdoms
 “and possessions of your Majesty; and in case of any emer-
 “gency they could repair damages, without danger, in
 “whatsoever port they might make for that purpose, as
 “being in your Highness’s own states; and thus in the
 “contemplation of the important service that could thereby
 “accrue to your Majesty, although personally hard pressed
 “and under heavy bonds for what I have expended in all
 “other armaments, as well by land as by sea, and in
 “maintaining the stores and artillery which I have in
 “this city, and which I dispatch to every quarter, and
 “the numerous other expenses and charges which every
 “day occur—since every thing has hitherto been done at
 “my cost, and all articles which we have to provide are
 “so dear and at such high prices, although this land be
 “rich, yet it does not yield to me sufficient resources to
 “meet the immense costs and charges that fall upon me;

“ but notwithstanding all this, bearing in mind what I
 “ have already said in this chapter, and setting aside for
 “ the present every difficulty that presses upon me, although
 “ I am constrained to inform your Majesty that I am
 “ obliged to borrow money on this occasion, I have
 “ resolved to send three caravels and two brigantines for
 “ this object, which I calculate will cost me more than
 “ 10,000 pieces of gold, and thus add this one service
 “ more to all the others that I have rendered, because
 “ I esteem it above every other if such a strait be found.
 “ *Now should this even prove otherwise*, it is not possible
 “ but that many great and rich countries may be dis-
 “ covered, whereby the service of your Majesty will be
 “ promoted, and the kingdoms and possessions of your
 “ royal crown vastly extended; therefore some ad-
 “ vantage may be gained *should such a strait not be*
 “ *found, in the knowledge your Highness would obtain of*
 “ *its non-existence, when orders should be given so that*
 “ *your Imperial Majesty might avail yourself, BY ANOTHER*
 “ *ROUTE, of those spice countries and their neighbouring*
 “ *states; and I hereby propose to your Highness that*
 “ *should it be your pleasure to cause them (the orders) to*
 “ *be issued and directed to me, I will undertake, in case no*
 “ *strait be found, to attain the object to your Majesty's*
 “ *advantage at a less cost.* Would to God that the expe-
 “ dition should succeed in its object, which is to discover
 “ a strait, because that would be most desirable, and which
 “ I think very probable, because with your Majesty's usual
 “ good fortune all difficulties vanish; and for its success
 “ I pledge myself to use every exertion both heartily
 “ and willingly.

“ In the same manner I am about to send the ships which
 “ I have constructed in the South Sea, and which, please
 “ God, will sail in the month of July this year 1524, to

“ explore the lower coast in search of the said strait,
 “ because should there be one, it cannot escape the ob-
 “ servation of either these in the South Sea or of the
 “ others going north; and as these who are going south
 “ will continue their exploration of the coast even as far
 “ as the land discovered by Magallan, whilst those to the
 “ North will pursue their route as far as the Bacallaos, it
 “ cannot possibly be otherwise but one or other of them
 “ should discover the secret. I assure your Majesty that
 “ I am in possession of such information in regard to the
 “ lands northward in the South Sea, that it might have
 “ been very profitable to me, for the good of your Majesty’s
 “ service, to have sent these vessels in that direction; but
 “ as I have been made acquainted with your Majesty’s
 “ great desire to penetrate the secret of this strait, and
 “ the immense benefit it would be to your royal crown to
 “ discover one, I at once set aside all other considerations
 “ and interests of notorious importance, to pursue this
 “ other route. May heaven direct, as may be most advan-
 “ tageous for the accomplishment of your Majesty’s wishes,
 “ and may I also be thus able to fulfil my desires to be
 “ of service.”

It was in one of these expeditions that Newfoundland
 was discovered, from which Cortes derived his ducal
 title. After his return from Spain, in 1530, he resumed
 his researches for a passage: his efforts were unsuccess-
 ful; but with the ships he had constructed in the South
 Sea, he discovered in person the Californias.

Towards the end of the seventeenth century Dampier,
 speaking of the Coatzacoalcas, said—“ This is one of the
 “ principal rivers of this coast; it is not half the breadth
 “ of the Tabasco river, but deeper. Its bar is less danger-
 “ ous than any on this coast, there being fourteen feet of
 “ water, and but little sea: within the bar there is much

“greater depth, and a bed of soft oasie ground.” * *
 * * “This river hath its rise near the South Sea, and
 “is navigable a great way into land, especially with boats
 “or small craft.”

The oldest amongst the documents of greatest importance which has next been obtained, is the narrative of a voyage of discovery which the engineer, Don Agustin Cramer, governor of the castle of San Juan de Ulua, performed in 1774, by order of the viceroy, Don Antonio Maria Bucareli. His report, although so brief as scarcely to occupy one sheet of paper, is nevertheless a proof of sound judgment, and of the professional views of a man of great capacity.

After his arrival at the isthmus, by the gulf of Mexico, he commences with this important notice :—“The bar of
 “the river Coatzacoalcos has on it at half-tide 24 palms
 “of water, excepting a very small portion of its length,
 “on which there are only 18 palms.”

“These soundings correspond with those taken on the
 “first survey, and afterwards by me ; for which reason,
 “and as frequent soundings taken by the present pilots
 “during the last thirteen years agree with them, it may
 “be inferred, that the said bar is permanently in the
 “same state, or that if any variation occurs it is so
 “inconsiderable that it has escaped notice.”

“After passing the bar, the river is six to eight fathoms
 “deep.”

Cramer continues his narrative briefly describing, but with admirable exactness, the course of the river up to Mal Paso, and demonstrates the facilities which the country presents for making a good road from this point to Tehuantepec, concluding with the remarkable observations which I here literally transcribe :

“The river-courses, with the mountain-chain inter-

“ rupted between Santa Maria Petapa and San Miguel
 “ Chimalapa, and the evenness of the grounds, plainly
 “ indicate that it would not be a work of great difficulty,
 “ nor excessively costly, to effect a communication be-
 “ tween the two seas across this isthmus. In the suppo-
 “ sition that the waters of the rivers Almoloya and Cituue
 “ were held back, a canal might be opened to join them
 “ with those of the San Miguel or Chicapa, the course of
 “ which into the Pacific Ocean, by the bar of San Fran-
 “ cisco, passes by the Venta de Chicapa, and from this
 “ spot forwards there are no further difficulties, because
 “ it is one perfect plain as far as Tehuantepec.”

When we have given the topography of the isthmus, it will be immediately seen how rational was this project, bearing in mind its application to a canal of small dimensions, such as was contemplated by Cramer.

It was with reference to these results that Baron de Humboldt, after having very properly asserted that until then “ the topography of the isthmus of Tehuantepec was “ quite unknown in Europe,” adds, “ we cannot doubt “ that this point of the globe deserves no less attention “ than the lake of Nicaragua.” However, it is evident that if the illustrious traveller ever saw any of the writings of Cramer upon the subject, it could not be the one I have just mentioned, for there is no allusion in it to the possibility alleged by the Baron, of a canal “ without “ locks, or without inclined plane.”

In 1820, Robinson, speaking upon the same subject, writes, “ We will now proceed to examine another (route “ for a canal) which, although it be deficient in some of “ the natural advantages of Costa Rica, still possesses “ others of so important a character as to render it almost “ doubtful to us at which of the two places the desired “ communication ought first to be opened.”

And, speaking of the Coatzacoalcos, he adds, "it is the
 "only port in the Mexican gulf where vessels of war, and
 "others of a large size, can enter, and is far superior
 "either to Pensacola or Espiritu Santo. There are at
 "all seasons on the bar, at the mouth of that port,
 "twenty-two feet water."

When the Mexicans had established the independence of their country, their first natural desire was to promote the development of the numerous elements of prosperity which their territory possesses, and which unfortunately remain in a great measure unprofited even at the present day.

In the year 1824, the state of Vera Cruz and the Federal Governments appointed each a commission to survey the isthmus: the former chose Don Tadeo Ortiz, and the latter selected Colonel Don Juan de Orbeago of the general staff; but it was only after the return of our commission to Mexico, that we could obtain the reports of Señor Ortiz.

His attention was specially directed to the promotion of colonization, and the cultivation of these fertile and favoured districts of the republic, upon all of which topics he enlarges with much enthusiasm; but on what relates to our purpose he furnishes no light whatever, and his plans are not admissible, excepting only in so far as they propose to render the Coatzacoalcos navigable to the confluence of the Malatengo; and further to construct a road from this point to the Pacific, passing through the Portillo de (gap of) Tarifa, the Venta de Chicapa, and the lagoons. He also observed the facility with which the Boca barra of San Francisco might be opened for the admission of large ships.

In the sequel we shall advert to these observations, but limit ourselves at present to quoting those which

refer to the bar of the Coatzacoalcos, and which are very important.

“ The bar of the Coatzacoalcos is permanent and constant, forming two canals or channels; that to the left or the west, has on it in the rainy season (that is, from the beginning of June to the end of February) $3\frac{1}{2}$ fathoms of water, or 21 feet, these being increased to 23 at high tides. That on the right or to the east, has $2\frac{1}{2}$ fathoms, or 15 feet, and both during the dry season lessen three or four feet, the principal channel maintaining itself at not less than 18 feet, except perhaps under extraordinary circumstances. When a vessel would effect an entrance, with a view only to greater security, the 15 feet channel should be preferred, because it has less current in it, and is probably wider, and because, when the sea-breeze blows hard, the currents are rapid in the great channel setting from east to west, and without taking a pilot it would be difficult if not dangerous to be entered by vessels of great draft of water.

“ Since the direction of the channels is from north to south, we are of opinion that vessels can enter with the wind from north, north-east and the easterly and southerly monsoons, by keeping to the wind. The prevailing winds offer no difficulty with the same precaution, only attending to the currents, which as before said, run with rapidity from the east to the west, and might cause vessels to be stranded. However, there are probably some periodical variations to the phenomena, which mariners would be the most competent to appreciate for their guidance.

“ The departure of vessels by both channels cannot of course take place with the above winds, but easily with those from the south and west, and off the land. The latter of which almost every day prevails, at least during

" the rainy season, from after midnight till eight or
 " nine in the morning, when the sea-breezes commence ;
 " on which account vessels should proceed to sea after
 " five o'clock A.M., until seven, but not later than eight,
 " which is allowing sufficient time for vessels to be beyond
 " the danger of drifting into the dangerous iron-bound
 " bay which is formed by the ridge of San Martin, run-
 " ning out to a promontory. "

It is evident that all these difficulties, described by Señor Ortiz for the entrance and exit of vessels, will completely disappear by stationing steamers at the mouth of the harbour.

The survey of Señor Orbegozo was made contemporaneously with that of Señor Ortiz, but he admits that he was in want of many things, and that on this account the results of his rapid examination must be defective under the unfavourable circumstances in which he was placed ; but as his narrative is printed, and the weight of his authority might be brought against us, we trust we shall be permitted to state the grounds for our trusting to our own observations, when they essentially differ with the results obtained by him.

The report of Señor Orbegozo commences like that of Señor Cramer with a description of the course of the Coatzacoalcos, and he states that it has 14 feet water upon its bar ; but it is to be observed that possibly he did not enter by the deepest channel, and it was in the month of May, and during an extraordinarily dry season.

Señor Orbegozo found, as well as Señor Ortiz, that it would be both easy and advantageous to render the Coatzacoalcos navigable as far as the confluence with the Alaman (or Malatengo) ; and from this point he proposes a carriage-road to be made as far as the lagoons, passing by the Chivela instead of by the Portillo de Tarifa, as proposed by Ortiz.

From a pier to be constructed on the edge of the upper lagoon, Señor Orbegozo says, that goods might be shipped upon flat boats to continue the communication as far as San Dionisio.

"Possibly," he says, "it might not be very expensive to excavate a haven on the opposite side of the bar of Santa Teresa, for vessels drawing 20 and more feet of water, and also deepen the principal bar;" and he concludes saying, "lastly if the small harbour which exists near the mouth of the river Tehuantepec was found to be better adapted for the anchoring of large vessels, then it would be easy to make an opening from the upper lagoon at Tilema (the western side of the lower lagoon) across the sandy tongue of land which divides them, and from Tilema construct a short canal to the mouth of the Tehuantepec to the South of the hills of Huilotepec."

As to the construction of a canal, he did not merely leave it problematical, but it appeared to him so beset with difficulties as to render it almost impracticable, which certainly would be the case if it rested upon the assumption, as he viewed it, of only making use of the waters of the Coatzacoalcos, taken from the eastward of Santa Maria Chimalapa, to be conducted to San Miguel and joined with the Chicapa.

I must not conclude this enumeration of the data which have been collected relative to the topography of the isthmus of Tehuantepec, without quoting the opinion of the first geographer of our times, the judicious Balbi, who considers the Coatzacoalcos "as the finest port of all the rivers which discharge themselves into the Gulf of Mexico, not even excepting the Mississippi itself."

PROCEEDINGS
OF
THE COMMISSION AT THE ISTHMUS.

We arrived at Tehuantepec on the 28th of May, and proceeded immediately to examine the state of the instruments which were to be used. These consisted chiefly of—

1. A theodolite beautifully constructed by Mr. W. Cary of London, but with only one telescope, and of small size, its diameter being only 0,127 metres.

2. A sextant of Gambey of 0,20 in radius.

3. Two ditto of Chevalier, of 0,15 in ditto.

4. Another of Cary's, of 0,13 in ditto.

5. A good level with telescope, of unknown make.

6. Two barometers (à cuvette) by Cary.

7. Two pocket chronometers, one by Roskel (No. 171), and the other by French.

Our journey from Mexico had occupied nearly a month, and the roads were so bad that almost all the instruments had been more or less injured.

The vertical axis of the theodolite was bent, although fortunately, in a very slight degree, and one of the sextants of Chevalier was found to be quite useless. We had taken the precaution to employ a man travelling on foot, to carry the chronometer and barometers, but the latter had been filled in Mexico with little care, and it was soon perceived that they contained a considerable quantity of air. We proceeded immediately to remedy these accidents

in so far as it was possible, and particularly to refill the barometers. A sufficient quantity of purified quicksilver had been brought from Mexico, but the filling of the tubes proved to be a work of some difficulty, and exceedingly irksome from the total want of convenient means, and from having to withstand both the intense artificial heat required for this operation, and that of a naturally burning atmosphere. I succeeded, however, in accomplishing the object, with the aid of Captain Gonzalez, in a manner which left no room to doubt the accuracy of any operations performed by means of these instruments. The preliminary arrangements occupied us until the 2nd of June.

It would naturally appear, that to proceed with accuracy the country ought to have been explored previous to undertaking any geodesical operation. We were however, from peculiar circumstances, induced to act otherwise.

The possibility of effecting a communication between the two oceans through the isthmus may be considered under four different aspects.

1. By a road.
2. By a tranship canal.
3. By these two means combined.

4. By a canal of great dimensions, which would afford a transit to the loaded vessels themselves from sea to sea. It is natural to suppose, that this plan being by far the most advantageous was that to which our attention was chiefly directed.

All accounts agree in the facility with which the river Coatzacoalcos might be rendered navigable, at least so far as its confluence with the Sarabia; therefore the space which it was most important for us to explore was that intervening between the confluence and the shores of the Pacific.

The rains appeared to have set in on the mountains

(sierra), which prevented the possibility of exploring them, and as our time was limited I resolved to take advantage of it by commencing proceedings on the southern side of the isthmus.

With this view we made a rapid excursion on the coast, during which I observed laterally and towards the north of the ground that divides the villages of San Mateo and Santa Maria, a tract of land which appeared to me well calculated for the measurement of a line to be used as the basis of our trigonometrical operations; and consequently the exploring party established their residence at San Mateo.

Messrs. Ortiz and Orbegozo had discontinued the soundings of the lakes and the Boca barra (bar entrance) of St. Francisco, because they could not find a boat for the purpose. This want was at once provided for by adapting a sail, oars, and helm to a common canoe.

Meanwhile I had directed some landmarks to be erected in those places which appeared to me the most fit as vertexes of the first triangles of our trigonometrical net. These landmarks usually consisted of three poles, so placed as to represent the skeleton of two pyramids, one of them resting inverted on the other. The smaller of the two, namely, the uppermost, was filled out, that it might appear conspicuous to the eye, and the observations were directed to the common vertex of both pyramids. From this point was suspended a plummet by means of which the instrument could be made to correspond vertically with the landmark, whilst any deviation in the perpendicular position of the latter could at once be detected by a stake which was driven into the ground precisely under the plummet.

The base line, which I had at first selected, had its two extremities in two hillocks from whence the greater part of those points which I first wished to determine could

be perfectly seen ; but the intervening ground presented a degree of unevenness that made me fear I should not be able to measure it with sufficient accuracy, considering the inefficiency of the means we possessed for the purpose. This circumstance induced me to fix another line on the beach, which happening to be remarkably level, was admirably adapted to the purpose. The new line was subsequently connected with the two original points best calculated for our observations.

The only means we possessed of measuring the base were two steel chains (a decametre each in length), one constructed by Mr. W. Cary of London, and the other by Mr. Yecker of Paris. We had likewise two levelling staves, of Chevalier, of two metres each, by means of which we measured as accurately as possible a straight distance of ten metres, which measurement was noted down on the floor of the parsonage house at St. Mateo, in order to use it afterwards as a means of comparison for the purpose of testing the alterations in the chains during the subsequent operation.

Our precautions for the measurement of the base were chiefly limited to what has just been stated. It would have been difficult to make them more extensive, and those acquainted with these matters will at once perceive that it would have been useless to attempt carrying them any further, since the instruments we had for the purpose of measuring angles enabled us only to do it within half a minute of their true value.

The tracing of the base was an operation attended with immense difficulty. The rainy season had commenced, and frequently impeded the prosecution of our labours. An almost incessant wind either blew down or inclined obliquely our landmarks, or causing the instruments to oscillate violently, disturbed our observations ; and lastly,

with the exception of a few moments before the rising of the sun and after its setting, a dense flickering vapour hid from view the objects which served us as guides, whilst the refractions, especially the lateral ones, produced the most strange illusions.

In measuring the base I used to proceed first with Yecker's chain, Messrs. La Trouplinière and Gonzalez following me with Cary's. On arriving at certain given spots, I calculated, by the difference found in the length of the two chains, the distance which my colleagues ought to find, and I had often the satisfaction to see that both measurements were identical. When the differences (which never exceeded three decimetres in a thousand metres) appeared to me too great, the operation was repeated, and thus it occurred occasionally that the same distance was measured in this manner four consecutive times.

The Zapoteco soldiers, who carried the chains, evinced a wonderful degree of intelligence, and in a very short time they became as proficient as could be wished.

After the necessary corrections to the mean sums of the separate measurements, the total length of the base was obtained, showing an aggregate distance of 16,930 metres.

During our residence in San Mateo we made a great number of meteorological observations, besides measuring a considerable series of angles for the purpose of establishing the position of various points. As to astronomical observations their number was unavoidably limited in consequence of the greater part of the nights being cloudy, and also from the high winds, which made the use of artificial horizons, and consequently that of the reflective instruments, extremely difficult. Every attempt to determine the longitude of that place proved vain, and I could only ascertain its latitude.

Mr. Theodore De La Trouplinière ceased to be a member

of the Commission at the beginning of August. Dividing the work therefore with Captain Gonzalez, we proceeded to raise the plan of the peninsula wherein are situated the villages of St. Mateo and Santa Maria, referring to the points trigonometrically fixed. The same was afterwards done with the coast of the Pacific as far as the Morro, and the tract of country between the sea and the town of Tehuantepec, including the course of the river by which it is watered, and which flows afterwards into the haven of Las Ventosas.

It had been suggested that this bay might be used for the purpose of anchorage; but, on examination, I found that its small size, as well as its exposure to the prevailing winds, made it totally unfit for such purpose, even supposing it were deep enough. The other haven to the west of Morro is also too much exposed, and filled with dangerous reefs; and though it be true that Cortes launched a few vessels in the first of these coves, it is well known that in those times vessels were built of small dimensions; and probably he made use of that spot, not because he considered it fit and safe for such an operation, but simply because it was the only one near at hand where it could be at all accomplished. The sands carried down by the waters of the Tehuantepec are now fast accumulating in the bay, and before long it will be completely obstructed.

Towards the end of August we returned to Tehuantepec, where the Secretary of the Commission was stationed, and there we had the pleasure of obtaining an able assistant in the person of the Captain of Engineers, Don Manuel Robles, Professor of Astronomy and Geodæsia of the Military College of Mexico. This gentleman brought with him several excellent instruments, the principal of which were—

1. A circle of Borda's of 0,35 metres of diameter, constructed by Gambey.

2. A reflecting circle of 0,20 metres, constructed by Mr. W. Cary.
3. A French theodolite of small dimensions.
4. A telescope of Dolland.
5. Two empty barometers (a cuvette) of Cary's.
6. A chronometer of Roskel, No. 301.
7. A level, with telescope.

Had we possessed instruments like these from the commencement the operations would have been undertaken in a very different manner, and we even had the idea of performing them over again, but it would have been necessary to use other means for measuring the base, and considering that time became every day more valuable, and that, after all, our labours might offer the required usefulness without going beyond the limits of a *good exploration*, it was resolved to go on in the same manner as before, rectifying, however, the results by means of observations made with the more delicate instruments.

The Commission then proceeded to San Dionisio Tepehuazontlan, having been joined by Don Mauro Guido, who, having left the secretaryship, usefully assisted to the last in the labours of the Commission.

As for myself, I carried on my observations in Camotepec and Juchitan, and proceeded to reconnoitre new points, in order to extend our triangulation. My object being attained, I sailed from the quay of Salina, near the Estacada, in the canoe fitted out as before-mentioned, and passing between the islands of Monapos-tiac and Natar-tiac I arrived at San Dionisio, the sounding line constantly showing nearly six metres depth of water, the bottom being mud and shingle, both easy to remove.

The natives of San Dionisio distinguish the lakes or lagoons in the neighbourhood of their village with very appro-

priate names. They call the more northern lake Duic-quialoi, which means upper sea ; and Duic-quialiat (lower sea), the southern. This latter lake they divide into two, by means of an imaginary line from the canal of Santa Teresa to the Boca barra, giving the names of Duic-namulet and Duic-nahuanot (western and eastern seas) to the supposed division. The Pacific they call Nadam-duic (great sea). I shall employ these equivalent names in alluding to the above-mentioned lagoons.

It was supposed before our exploration that the lower lake extended as far as the bar of Tonala (some sixty quilometres to the east of the Boca barra), leaving between the lake itself and the Pacific a narrow strip of land, designated by the name of the island of St. Francisco. It was believed, also, that the whole of the lake was nothing else but a creek of little depth and no importance, as is the western part, known likewise by the names of lagoon of Tilema and Dead Sea. However, on ascending the hill of Umalalang, which overlooks the village of St. Dionisio, this erroneous impression was soon dispelled, by observing that the ground to the east of Boca barra extends itself considerably, and contains other lakes of some extent. This induced me to explore it at once.

On proceeding thither, the eastern part of the lower lagoon attracted my attention, as I could not but observe that its vicinity to the Boca barra and the canal of Santa Teresa, its considerable depth and excellent bed, and the circumstance of being so well sheltered from the prevailing winds, fitted it admirably for a commodious and safe anchorage.

Whilst Captain Robles was raising the plan of a portion of this lake, I proceeded with Lieutenant Guido to explore the Boca barra. The tide, which was beginning to ebb, produced a current that did not allow us to steer our

imperfect craft, and was carrying us towards the sea with such force, that we clearly saw by the effort necessary to keep our position that it would be impossible to surmount its impetus so as to effect our return, should we be carried out. The tide was too strong to use the sounding line, but it was evident that a sand bank obstructs *internally* the Boca barra throughout its whole length from east to west, and it appeared to me important to investigate the cause which might have produced it.

The idea that a canal of great dimensions was the only advantageous means of effecting the desired communication, induced me from the moment of my arrival in the isthmus to use every endeavour to ascertain the course and volume of waters of the several rivers, without being deterred by their distance from the localities pointed out hitherto as the most favourable for the purpose. Amongst them all I directed my most particular attention to the river Ostuta, remarkable for the volume and regular course of its waters, which were said to flow into the Pacific by the bar of Tonalá.

The origin of this river is unknown and has never been examined from the popular belief that it proceeds from a spot so rugged among the mountains as to be almost inaccessible. The general opinion, founded on vague traditions, is that it takes its source from a large lake situated somewhere in the mountains, supposed to have also lent their waters to the rivers Coatzacoalcos and Chicapa, with the romantic addition that the said lake is under the dominion of a *fair lady*, who appears to those who have the hardihood to visit its shores.

This popular opinion arises from having observed that these three rivers increase in volume when the northern winds blow, and then decrease simultaneously, whilst their waters are constantly clear and limpid, the natives attri-

buting these natural and simple phenomena to an improbable overflow of the waters of the lake when agitated by these winds.

In the course of our operations we were greatly surprised to find that the river Ostuta does not discharge itself into the Ocean by the bar of Tonalá as we had been led to suppose, but that after having formed the lagoons, situated in the neighbourhood of St. Francisco, it flows through the Barilla and the mouth of Lagartero, in the Duic-nahuanot.

It may bewell to observe, that although the waters of the Chicapa and of the Ostuta are always limpid, this is only to be understood of the upper part of their course, for in the plain during the rainy season they often gather the sands of the alluvious soils through which they flow.

On entering the eastern lower lagoon, the currents of the Ostuta flow along the southern shore, and decreasing gradually in their impetus they reach the Boca barra so powerless as to deposit there the sands they bring with them; these are afterwards shaped into a large sand-bank by the waves, kept in incessant agitation by the northerly wind which prevails almost constantly in those regions.

In the plans which will be proposed, it is intended to make use of the waters of the Ostuta, taken from the sierra, in order to feed the canal, by doing which the principal cause of the formation of this bank would be removed; but as it would not be possible to prevent the waters that join the Ostuta in the plain from flowing in the same channel, and as this river did formerly flow into the lake of Tonalá, it would be advisable to shape again its course in the primitive direction, an operation which offers no difficulty whatever.

The sand-bank of the Boca barra, however, may I think be attributed to another and more powerful cause. The

river Tehuantepec flowed not many years ago into the western lower lagoon, as may be seen by the map of the southern division of the isthmus. The opposing currents of both rivers destroyed reciprocally their strength, and caused the deposit in that particular spot of the matter they bring with them. Fortunately the river Tehuantepec spontaneously abandoned this direction, and care should be taken to preserve it in the course which it has now adopted.

It appeared to General Orbegozo that the sand-bank of which we have spoken was produced by the rivers Chicapa and Juchitan; but I cannot coincide in this opinion. There is no doubt, that during the rainy season these two rivers are loaded with sands, especially the latter, which traverses a large tract of moveable earth, as is shown by the respective size of the alluvial deposits which these rivers have formed at the entrance of the upper lagoon; but to me it is also evident that they cannot do less than deposit these sands in the lagoons which they have to cross in their progress towards the Boca barra, before reaching which they have therefore freed themselves of most of their sands. Were it not so, they would deposit them, as is always the case, on the outside of the Boca barra, forming a *true bar* quite different from the sand-bank now under consideration. However, should it be ascertained that the two rivers contribute to its formation, it will be seen that the Chicapa is one, the course of which will be directed to supply water to the canal; and as regards the Juchitan, it would not be difficult to change its course, or compel it to discharge its superfluous matter in a convenient part of the lower lake previous to its flowing into the sea.

These obstacles once removed, it would be neither difficult nor expensive to render practicable the Boca

barra, with the certainty that the sand-bank, which offered so great an obstacle to the projected communication, would never be formed again.

Taking advantage of a calm, between two tides, Messrs. Robles and Guido succeeded in going out to sea through the Boca barra, and executing the soundings indicated in the plans. They found that immediately after passing the bank there is a canal, the depth of which, even in the shallowest part, is of nearly six metres, this depth increasing afterwards rapidly.

At present the tract of land to the east of Boca barra cannot with propriety be called an island, since it is only temporarily during the rainy season that its lakes communicate with the lake of Tonalá, by means of some marshes through which the natives can only with great difficulty drag their insignificant canoes.

The exploring party concluded operations in this part of the isthmus, and returned shortly afterwards to San Dionisio, notwithstanding the bad weather and various accidents, which greatly impeded their labours.

We remained at St. Dionisio the required space of time to collect and arrange the necessary data for raising the plan of the lakes, and of a part of the land between them and the river Ostuta.

The weather continued unfavourable, particularly for astronomical observations, and various attempts made to determine the longitude of St. Dionisio were frustrated, although its latitude was ascertained. No opportunity was neglected to collect copious series of barometrical observations.

The party assembled at Juchitan towards the end of October. This spot proving to be the centre of several trigonometrical operations had been selected for the purpose of referring to it the position of all the

other points, after having previously ascertained its exact latitude and longitude.

The projector, Don José de Garay, expressed from Mexico his earnest wish that the exploration of the river Coatzacoalcos should be immediately proceeded with, and upon the termination of the labours at San Dionisio, it was considered that the season was sufficiently advanced to comply with this request.

When I left for Coatzacoalcos, accompanied by the secretary Don Pedro Garay and Don Mauro Guido, the exploring party were divided into two sections, one of which was entrusted to Captain Robles, in whose abilities complete reliance could be placed. This gentleman undertook also the superintendence of the observations necessary to determine astronomically the position of Juchitan, as soon as a favourable opportunity should offer, and I requested him to extend the trigonometrical operations as far as the foot of the mountains, and especially to explore the upper part of the river Ostuta, which had before attracted so much of my attention. This section of the party established themselves in the Venta de Chicapa, which from that moment became the meeting point of the Commission until the close of their labours in the isthmus.

As regards ourselves, we arrived at the Mal Paso, after having passed through Chivela, Guichicovi, and Boca de Monte. Guichicovi is situated at the commencement of the rugged part of the sierra; and the gentle hills in the neighbourhood of Chivela, approaching this spot, are, at intervals, interrupted by precipitous ravines, through which several rivers and streams find a passage for their waters. The surface of the ground becomes more level receding from Guichicovi towards Boca de Monte, from whence, as far as the Mal Paso, it finally becomes a perfect plain, occupied by a forest of useful and precious timber.

On arriving at the Mal Paso, I was surprised at the view presented by the Coatzacoalcos, which from the transparency and slow progress of its waters had more the appearance of an artificial canal than that of a mighty river. Its banks of strong clay, are firm and easy of access, with an almost uniform elevation of a few metres, which leads to the supposition that the river runs along a level surface, although the thick woods that line its shores conceal from view the topographical aspect of the land covered by them.

Our excursion along the river scarcely deserves the name of an exploration, especially as the weather was so unfavourable as not to allow us to make any kind of observation. Neither was it possible to take soundings of the bar on this occasion ; but we learnt, however, that only a few years ago a French vessel of five metres and a half of draught entered it ; and from the battery situated at the left entrance its principal channel appeared to me more gentle and clear than any other with which I am acquainted. It is well known that bars owe their formation to the materials conveyed by rivers, hence the unobstructed regularity of the bar of the Coatzacoalcos is simply accounted for by the clearness and limpidity of its waters.

A short exploring expedition was made from the Fabrica, or Mina-titlan, to Acayucam. The season did not permit of our undertaking any operations to trace the course of the river, and on our return to Mina-titlan we again ascended the Coatzacoalcos, as far as its confluence with the Jumuapa, which we also ascended as far as the Paso de la Puerta, and from this place took the direction of Chivela, passing by Guichicovi.

From Chivela we proceeded towards Tarifa along a table-land covered with a great number of gentle and

interrupted declivities, and along a road so level, that it inspired me with the most flattering hopes. From Tarifa the ground continues to be still more favourable as far as the Portillo or gap, from which a rapid descent leads to the plain, in which is situated the Venta de Chicapa. Our tour had lasted a month, during which Messrs. Robles and Gonzalez had actively continued their operations, not only in the lower part of the country, but also in that which extends from the village of San Miguel to the hills of Petapa. Captain Robles had likewise examined the ground from San Miguel to the river del Corte, in the neighbourhood of Santa Maria Chimalapa.

The reports which awaited me were not very favourable. The exploration of the river Ostuta had been abandoned, because it was supposed to proceed from too eastern a direction to be available; and it appeared that the only river still deserving our attention was the Coatzacoalcos, although the exploration of General Orbegozo seemed to show that any attempt to make its waters available would meet with almost insurmountable difficulties.

These accounts, however, were not sufficiently positive to cause me to be dismayed, and meanwhile I resolved to reconnoitre the points which had been fixed during my absence. On arriving at one of these, on the summit of a hill about 1600 metres to the north of the village of San Miguel, which afterwards received in commemoration the name of Cerro de Albricias (Reward hill), I saw the problem at once solved.

The Sierra Madre (or principal chain of the Andes) appears to be interrupted, as the engineer Cramer judiciously observed, between Santa Maria Petapa and San Miguel Chimalapa. On the western side it descends rapidly as far as the first of these villages, and proceeds again suddenly towards the east of the second, leaving in the middle

a surface comparatively level. To the south the small chain of Masahua and Espinosa, of moderate elevation, forms a barrier between this hilly tract of ground and the true plain, terminating at their extremities in two openings or gaps, through the westernmost of which descends the road from Chivela leading to the plain, and another through the eastern from Tarifa to the Venta de Chicapa. On the north, the table-land extends itself, gently descending as far as the Coatzacoalcos, and from thence to the Atlantic.

The river Chicapa reaches San Miguel, occupying in its course from east to west the bottom of a straight dale, between two uninterrupted chains of mountains, and then suddenly proceeds in a north to south direction towards the plain wherein is the upper lagoon which receives its waters.

Running in a line diametrically opposite to the first course of the Chicapa, namely, from west to east, the stream of Monetza joins the above river near San Miguel, by another dale, which in reality is only the continuation of the first, and would lead directly to Tarifa were it not divided from the plain on which this estate lies by a small chain, of which the Cerro del Convento forms a part.

The village of San Miguel is situated in a small valley lower than the plain of Tarifa, by more than 80 metres ; but as the most northern of the two chains between which the rivers Chicapa and Monetza are enclosed has no interruption whatever, I thought it possible to convey along its side the waters of the first of those two rivers as far as Tarifa, from whence they might be distributed to both seas ; neither did I consider it difficult to surmount the natural barrier formed by the small chain of Convento, between the valley of the Monetza and the table-land of Tarifa. The hill of Convento rises almost isolated, and the gaps on

both sides, especially the northern, is of so trifling an elevation above the ground, that a cut through the latter would be an almost insignificant undertaking.

This discovery induced me at once to give up the idea of returning to the Coatzacoalcos with the view of raising the plan of its course, as I had at first resolved, and I entrusted this operation to Messrs. Robles and Gonzalez, who immediately proceeded thither for the purpose.

Meanwhile I directed that Lieutenant Guido should station himself at Tarifa with a barometer, whilst I, following the dale of the Chicapa, arrived with another barometer to the place called the Ultimo Rancho where I thought the elevation of the river might be equivalent to that of the plain of Tarifa.

Two series of barometrical observations performed simultaneously in two successive days, and under the most favourable atmospherical circumstances, showed that these two points are on the same level, whilst about two quilo-metres higher up from the spot in which I stationed myself the river forms a cascade of nearly seven metres high.

From San Miguel to the Ultimo Rancho five constant streams join the Chicapa, and having measured the waters of this river in a point below its junction with these streams I find them equivalent to more than five metres per second, so that by adding to it the Monetza, and the stream which runs through San Miguel, called Xoxocuta, a body of waters of about seven cubic metres may be reckoned upon. According to all the information collected these waters were then in a state which might be considered the *minimum* of their quantity, and they are always exceedingly clear and pure.

This satisfactory result induced me to undertake without loss of time the inspection of the hill of Convento in order to judge of the magnitude of the

difficulties that might offer in that quarter. The dreaded obstacle has been in a great measure removed by nature.

In that part where the hill of Convento is most depressed, namely, the northern side, the river Monetza takes its source, and following along a dale in the centre of the hill itself, penetrates under it, and crossing it entirely, comes out in the small valley through which it runs to San Miguel. The point of the opening in which the river has its origin is entirely hollow, since the gush of water which forms it, issues from the walls of a cave or fissure about seven metres high, and the thickness of its vault is perhaps another metre. Besides, the situation of the hill and the rock of which it is composed, which being of pure marble is admirably calculated to procure beautiful building materials as well as excellent lime to cement them, are all inviting circumstances to convert it into a quarry; thus, even were it considered necessary to make a cut in this part of the hill, the work would be accomplished whilst opening the quarry to procure the necessary materials.

The river Monetza in running under the Cerro del Convento has only to cross a distance of about a hundred metres, although it passes through the very centre, and consequently the thickest part of the mountain.

Another barometrical level obtained from observations performed simultaneously at Tarifa and at the source of the Monetza showed that the level of this river is nearly the same as the stream adjoining Tarifa, the waters of which run to the Coatzacoalcos. The ground that lies between Tarifa and the source of the Monetza is not only level, but is even interrupted by torrent streams, the waters of which flow into the Monetza; and as these streams have their origin at a short distance from Tarifa,

this ought to be considered as the proper spot for the division of waters in the canal.

The houses of Tarifa are somewhat elevated in the midst of a ground so level, that in the rainy season it becomes inundated, for which reason this plain has been called the lake of Tarifa. I took advantage of this circumstance to save the trouble of a new levelling from the latter place and the Portillo, or opening of the road to Venta, since the line left by the waters on subsiding clearly shows that the two points are nearly on a level; thus, with a cut a few decimetres deep in the edge of the Portillo, the waters to the south of Tarifa would proceed towards the Pacific, whilst those on the northern side naturally run towards the other sea.

To complete my wishes, I only wanted now to find the manner of increasing the volume of available waters, and to avoid having recourse to the expensive means of constructing great deposits; and recollecting that on my journey from Chivela to Guichicovi the situation of the source of the Almoloya had been pointed out to me from afar, I did not think it impossible to take advantage of the waters of this river.

By means of a series of barometrical observations made at the same time at Tarifa and Chivela, I previously found that the first of these estates is less elevated than the second, contrary to that which was formerly believed. Employing the same means, the Chivela proved to be 15 metres lower than the source of the Almoloya, a difference which might be increased by damming up the sources of the river. I have measured its waters, doing afterwards the same with those of the streams of St. Domingo, Citune, and others of less note, and I accordingly calculate, that by joining them all, a volume of waters of more than two cubic metres might be conveyed to Tarifa at the least favourable

season of the year, and another considerably greater during the remainder. These waters have also the great advantage of being always clear, but their distance from Tarifa, and the difficulties of the ground they would have to cross, would make their conveyance somewhat expensive; and therefore I thought that something else remained for me to do, and I resolved to examine the mighty river Ostuta.

I returned to the Venta, from whence I proceeded to Zanatepec for the purpose of finding some natives who might act as guides. I experienced some difficulty in fording the river, which was rather swollen, notwithstanding which its waters continued to be perfectly clear as far as that spot. On reaching Zanatepec I examined the documents deposited in the archives of the village, amongst which I found a few fragments of a plan of the land comprised in its jurisdiction. This interesting document, almost entirely destroyed, may be inferred to have been executed during the first period of the Conquest; for whilst it is painted on paper, made of *Maguey* (agave Americana), and preserves all the characteristic signs of the Aztec works of this kind, there is on it a figure of a Spaniard by whose order the plan was probably raised; but that which most particularly attracted my attention was to find noted down the traditional opinion that the river Ostuta takes its source in a lake.

It was with the greatest difficulty that I found any one able to accompany me in the exploration of the river. Amongst the inhabitants of the town, there were only two old men who remembered having visited a small portion of its course, and pictured with the blackest colours the dangers and difficulties of the undertaking. It would be tedious to enumerate those which existed in reality; suffice it to say, that after several vain attempts I suc-

ceeded, by following up the banks of the river, in reaching the foot of the high hills from whence it proceeds. Throughout the whole distance the river receives no constant tributary, and its waters increase as they approach their source, which shows that a portion of them becomes absorbed in the lower part of the course of the river.

I have not measured the waters of the Ostuta, not only on account of the difficulty of doing so, but because they often vary in an extraordinary manner; but I believe I may venture to assert, that they are never less than three times as copious as those of the Chicapa, and frequently more than six.

The wild state of the country compelled us to cut our way through the woods when we could not take advantage of the pathways or tracks formed by the numerous tapirs which inhabit those regions. For this reason, and also on account of the rugged hills between which the river is imbedded, it was impossible to discover the adjacent grounds; but the direction in which we had constantly proceeded, namely, towards the north and inclining afterwards to the west, as well as the distance we had gone, made me suppose that we were near the upper course of the Chicapa. I was not mistaken, for I perceived suddenly at a short distance to the west the Cerro Atravesado, an eminence which I had reconnoitred before to its very summit, after the first fruitless exploration of the river Ostuta.

The elevated situation in which we were, and the proximity of the two rivers, seemed to promise that there would be no great difficulty in effecting their junction; but the intervening woods, by concealing from view the topographical aspect of the ground, did not permit a fair estimate being formed of the difficulties there might be to encounter.

The river came down precipitously from the mountains,

and for a considerable distance had ceased to be fordable. It was every moment more and more difficult to ascend its course along the same bank, and at last it became evident that, in order to estimate correctly the obstacles which might oppose themselves to the projected junction, nothing else remained but to reach, if possible, the very spot where we then were, by descending along the craggy side of the Cerro Atravesado which lay opposite.

Meanwhile it appeared evident to me that both the Chicapa and the Ostuta proceed from that portion of these territories where the Sierra Madre is highest, which explains why these rivers increase and diminish simultaneously, without its being at all necessary to suppose that they owe their origin to a lake. The attraction which mountains exercise upon the clouds is well known. The clouds which proceed from the Atlantic, or which are formed on the immense plain watered by the river Coatzacoalcas, as well as by a great number of other rivers, streams, and lakes, whenever the wind blows from the north, are wafted precisely in the direction of this elevated portion of the Sierra which they have to traverse, and which compels them to discharge their contents on its summit, from whence they descend transformed into streams and rivers ; nor is it less evident that when other winds prevail, as the same causes do not exist, so the corresponding effects naturally cease.

On my return from this expedition I went to Nltepec, for the purpose of ascending the Atravesado. The bad weather overtook me on its summit during the night, and the following day, finding it impossible to withstand its inclemency without a shelter, I was about to abandon the undertaking, when an interval of hope encouraged me to persist, and the weather, becoming more genial, rewarded my perseverance.

On arriving at the north-eastern extremity of the tableland we found it necessary to alight from our horses and undertake the descent of the hill on foot, as we did when exploring the course of the Ostuta.

The Cerro Atravesado stands completely isolated on every side, except here where it ends in a kind of ridge, and which descending to the valley is joined by another proceeding from the summit of the Sierra Madre.

I resolved to follow the first of these ridges, in order to explore the ground which divides the two rivers, and I was not long in reaching the point where it is most depressed, and from which the relative position of both rivers was perfectly clear and obvious.

Near me, to the west, was the deep ravine through which the Chicapa runs, and to the east the elevated grounds of the bed of the Ostuta, which I had just visited, and which I recognised perfectly at a distance of less than a league. The difference of level between these two points is so considerable, that there cannot be a doubt of the facility of effecting the junction of the two rivers; and it is no less evident that, in the short space which intervenes, there is no obstacle whatever to prevent it. The weather clearing up I was enabled to make several observations from points still more elevated, by means of which I ascertained beyond all question the favourable nature of the ground, and as no doubts remained on our minds on the subject, I considered the exploration of these parts quite completed.

In these expeditions, as well as those of Coatzacoalcos and others no less toilsome, I was accompanied by my friend and countryman, Don Estevan Maqueo, one of the present proprietors of the Haciendas Marquesanas, in whom the Commission found a most useful and willing assistant.

The Commission had for a long time entertained a wish to ascend to the highest point of the Sierra in those parts, from whence, in all probability, both seas could be discovered. On this occasion we were about attempting it, but the clouds began again to cover the Sierra, and we had to abandon the undertaking.

Whilst I was engaged in these explorations, Captains Robles and Gonzalez had returned from Coatzacoalcas, after raising the plan of its course from the confluence of the Sarabia to the sea; and under the superintendence of the former they made some astronomical observations, in order to ascertain the longitude of Juchitan, and obtain a trigonometrical level of the principal points of the isthmus.

Want of health did not permit Captain Gonzalez to take from that moment any part in the labours of the Commission when they required much physical energy and activity, and therefore the operations which were still to be performed for the complete exploration of the isthmus were divided between Captain Robles and myself.

Captain Robles went to ascertain the latitude and fix the situation of Santa Maria Chimalapa, which had not yet been obtained, and afterwards to note the course of the river del Corte from the most elevated point he could reach, as far as its confluence with the Sarabia.

At the same time I undertook to explore the country between Tarifa and the confluence of the two rivers, Malatengo and del Corte. This part of the country is the most fertile and pleasant that it is possible to imagine. Shortly after leaving Tarifa it is truly interesting to observe, mixed together, the spruce fir-tree of the cold climates, the oak of the more temperate, and the palm-tree of the warm regions. Further on, these trees as well as beautiful green meadows of vast extent occur alternately with woods of a luxurious tropical vegetation. Trees of precious woods,

wild cocoa, vanilla, &c., are everywhere seen. The plains near the rivers, cultivated by the inhabitants of Barrio, Santa Maria Petapa, and San Juan Guichicovi, give an idea of the astonishing fertility of the soil, since the natives only come in time to burn down the brushwood; they sow without cultivation, and scarcely ever revisit their corn-fields until the harvest time.

These very circumstances made the exploration difficult. It being often impossible to examine the ground in any other way but on foot, I found myself beset by the tall shrubs of a luxuriant vegetation, which did not allow me to see any of the surrounding surface.

My principal object had been to find out the best line through which a canal might be opened from Tarifa to the river del Corte, but a great part of the ground is covered by a succession of hillocks so vast and complicated, that it might afford numerous solutions of this problem, and it would be impossible to select the most advantageous site without first bestowing upon the subject a long and careful study. Meanwhile from Tarifa the waters descend naturally to the Coatzacoalcos through grounds by no means too rugged, whilst the very existence of a labyrinth of hillocks, almost all individually isolated, or else joined together by ridges of an insignificant thickness, are sufficient to prove the practicability of the work.

I have ascertained the situation of various points, rectified some erroneous notions previously admitted respecting the course of the principal rivers which flow into the Malatengo, and followed the course of this river from its junction with the Chichihua for about two-thirds of the distance which separates it from the river del Corte. Throughout the whole of this space its course is neither rapid nor tortuous; and although it was the season when

its waters are lowest, it carried a volume of more than fifteen cubic metres per second.

Captain Robles accomplished also satisfactorily the exploration of the river del Corte, although the bad weather and other unfavourable accidents had molested us both considerably.

I immediately set out again and reached the river del Corte, passing through San Miguel and Santa Maria Chimalapa with the view of inspecting that part of the country which I had not yet visited. Captain Robles at the same time had gone to Juchitan, and made new observations to ascertain the longitude of that place.

I went in company with the same gentleman to San Miguel, and again examined the brow of the Sierra, which limits towards the north, the course of the Chicapa and that of the Monetza, in order to become positively assured that we had not left unobserved any part which might offer an obstacle to the execution of the work. After this last inspection its accomplishment appeared to us even more easy than we had hitherto considered it.

The Commission definitively left the Venta de Chicapa where they had fixed their residence, and with Captain Robles we went to the Hacienda de Santa Cruz, the village of Chihuitan, and the Rancheria de Comitancillo, the situation of which we fixed on the plan, and with this last operation I had the satisfaction of knowing that none of the places which had been the object of our researches in the isthmus had escaped my personal notice.

On the 25th of March, 1843, after nine months of toilsome labours, we came back to Tehuantepec, to prepare for our return to Mexico, as we considered the exploration of the isthmus to be now quite completed.

In the description of the Coatzacoalcos, given by Captain Robles, I have not found any thing that does not agree with my own observations and notes, excepting the width of 700 metres attributed to the river near its mouth, where it is widest. Judging from sight only, I had supposed it to be 500 at the utmost; but as Messrs. Robles and Gonzalez measured that distance by means of a micrometer, it is probable that my calculation was incorrect. Besides, this question, after all, is quite insignificant, and I only mention it that the report of our operations may be as correct and accurate as possible.

The following report is literally the same as that which was forwarded to me by Captain Robles after his exploration :

COURSE OF THE RIVER COATZACOALCOS.

The river Coatzacoalcos takes its rise in the unexplored part of the Sierra Madre, and the highest point in its course which we visited was at its confluence with the Chimalapilla, from whence we examined it all the way to its mouth in the Gulf of Mexico, situated in $17^{\circ} 8' 30''$ north latitude, and $94^{\circ} 17'$ west longitude from Greenwich.

The Chimalapilla falls into the Coatzacoalcos on its right bank, 7 kilometres to the S.S.E. of the village of Santa Maria Chimalapa, and this confluence is 119 metres above the level of the sea. We were assured by the Indians that they had ascended the river still higher than that point on their rafts, during six days, which may be reckoned about 90 kilometres, until they came to the junction of two small streams forming the river, and the course of which was too precipitous to allow of being any longer followed in their rafts.

On the same side, and at a short distance below the Chimalapilla, is the confluence of the river del Pinal, so

called because it flows through mountains whereon the pine-timber was cut by the Spanish government to be sent to the Havannah for the masting of large ships, and for this reason this part of the Coatzacoalcos is still called the river del Corte (of the cutting).

As far as the confluence with the river del Milagro, which enters on the left bank at 2½ kilometres to the W.N.W. of Santa Maria, the Coatzacoalcos takes a precipitous course through a deep ravine, with a descent of 40 metres in the space of 19 kilometres, that is 0,21 metres in every 100 metres. The mountains which border the channel are at first very high and precipitous, but gradually lowering and softening in their character as the mouth of the Milagro is approached, they then appear only as hills of moderate elevation, and the river has changed from being a rapid torrent, in which the rafts could with difficulty float, into a quiet stream, with only occasional rapids of small extent. The rocks on the banks of the river are of sand-stone, calcareous spar, and slate, although this last but rarely occurs. The limestone is excavated by the river, which thus appears to pass under the ruins of a bridge.

In the few small patches of level ground, on the borders of the river, the Indians of Santa Maria plant maize, tobacco, and cocoa; some of these tracts of land being only accessible in rafts, and others only by very craggy pathways.

The volume of water now filling the river is considerable, for as I descended, I found it to be about 45 cubic metres per second, and the Indians assured me that it was rarely less.

Beyond the confluence of the Milagro the river, hitherto running from east to west, follows a general direction towards the S.W. as far as the mouth of the Escolapa,

and after that to the N.W. as far as that of the Malatengo. Both these rivers flow into the Coatzacoalcos by its left bank; and the Escolapa as well as the Milagro, and the streams which unite with it, have their sources in the desert part of the Sierra to the east of the road which leads from San Miguel to Santa Maria Chimalapa. The course of the Malatengo and its tributaries are laid down upon the map.

The hills on either side become gradually depressed, and at a short distance from the Escolapa they are very insignificant; nevertheless the rocks before mentioned frequently show themselves, forming the rapids already spoken of, and which give rise to many windings, so that the course of the river between the confluence of the Milagro and that of the Malatengo is 46 kilometres.

Half way between the Escolapa and the Malatengo is the station of the Angostura, so called from two beds of greenstone rock rising in the middle of the river, whilst the banks of the stream, also of the same formation, are very precipitous; so that the channel, which above this spot was 30 metres wide, becomes divided into three, the widest of which is only five metres broad. Some of the rapids are caused by this very rock, but from this place forward they considerably diminish.

As the Malatengo is approached the hills reappear with more elevation and frequency on the borders, and continue the same beyond its confluence, so that the accession of waters to the Coatzacoalcos is now more perceptible in its greater depth, which from this place to the mouth of the Sarabia is generally from $1\frac{1}{2}$ to $2\frac{1}{4}$ metres, and sometimes even five metres deep, than in its breadth, which does not exceed 35 to 40 metres.

Next after the Malatengo the rivulet of rio Chico joins on the right bank coming from the Sierra of Chimalapa; and at no great distance on the other side enters a stream, near which is an ancient wharf called Mal Paso, so named on account of a strong rapid a little below it, and which caused it to be abandoned. At the present day another loading place is called by the same name, but this is 200 metres above the Paso del Sarabia close to the mouth of the river of the same name.

This rapid, which is the strongest to be found after leaving Angostura, is formed of various ridges of calcareous spar and granite, and occupies a space of 180 metres. The first of these rocks frequently occurs at the base of the hills, and often forms smaller rapids.

After the junction of the Sarabia the hills become inconsiderable, and almost entirely disappear a little below the river Jumuapa (or de la Puerta); the rapids also are less frequent, and the last of them, called the Suchil, is seen just before reaching the mouth of the river Jaltepec (or de los Miges).

The rivers Sarabia, Jumuapa, and Jaltepec enter the Coatzacoalcos on the left bank, and next to them the Chalchijapa on the right hand. The two first descend from the sierra of Santa Maria Guienagate, and although the Sarabia has much water it is not navigable, on account of its course being too precipitous, and having near its mouth a fall which impedes the entrance of canoes; but the Jumuapa can be ascended by them, in the rainy season, to the point named the Paso de la Puerta; from whence the road to San Juan Guichicovi is shorter and better than the one from the Paso del Sarabia. The river of Miges has its source in the sierra of the same name in the district of Villa Alta; and notwithstanding the rapidity of

its current, it is navigable all the year round for canoes to a spot called Tutla, distant 12 kilometres from the village of Trinidad. The distance from Tutla to the mouth, calculating by the time occupied in ascending it, may be reckoned at 80 kilometres. The river Chalchijapa carries also much water; the Indians of Santa Maria ascend it for five days with rafts, and then cross by land to their village, which is 61 kilometres distant from the point where they leave their rafts.

Between the Jumuapa and the Jaltepec the stream Amate runs into the Coatzacoalcos, and between the Jaltepec and the Chalchijapa that of Las Perlas, both on the left bank.

Between the confluence of the Chalchijapa and the point of Horqueta, where the river is divided into two branches, the stream Colorado, the rivers Naranjo and Peñas Blancas, and the stream Cuapinoloya join the river by its left bank, and the brook Churriagao by the right; the latter and the Peñas Blancas come from large lagoons not far distant.

The general course of the Coatzacoalcos from the confluence of the Malatengo to that of the Jumuapa is from S. to N.; then it runs N.W. until it meets the Jaltepec; and thence to the bar its course is N.E. The length from the mouth of the Malatengo to the Sarabia is 35 kilometres: from the Sarabia to the Jumuapa, 27; from the Jumuapa to the Chalchijapa, 36; and to the Horqueta 65 more, being a distance of 163 kilometres, between the Malatengo and the Horqueta.

The banks of the river, after quitting the hills, are generally from three to five metres high, without being steep; and they are so low as to be occasionally covered in times of flood. At some few spots called *cerritos* or

hillocks, the banks are from 12 to 20 metres high, and are composed of beds of clay. Among them, only the Oajaqueña, Tecolotepec, Churriagao, Peñas Blancas, and Cuapinoloya, are worth mentioning. Below those of Tecolotepec, at the bend of the Cascajal, the river overflows its right bank, and the waters that escape, join the river Coahuapa, which unites with the Coachapa of which mention will be made hereafter.

In consequence of the low and sloping banks which here suffer the river to spread out laterally, and the slowness of the current, which after the confluence of the Jaltepec is scarcely apparent, the depth of the stream does not increase so much as might be expected; and during the dry season, shoals are even to be met with covered only by half a metre of water. These shoals are formed of sand and gravel, and almost all of them are small. Those of any extent are, one commencing below Tecolotepec, which occupies the greater part of the bend of Cascajal; another between the river Naranjo and the brook Churriagao; another that of Cuapinoloya between the island of this name and one a little lower down; and lastly, that of Horqueta obstructing the entrance of the two branches of the river which is divided at this point.

These two branches again unite after having formed the island of Tacamichapa. The one to the west called Mistan is longer and narrower than that to the east called Apotzongo; the length of the first is 55 kilometres, its width between 90 and 100 metres, or about 20 to 30 metres less than the river was before it became divided; and the depth is above 4 metres. Several streams fall into it, and near the extremity is the creek of Monzapa which has from 3 to 4 metres of water at its entrance, and reaches nearly to the village of Tesistepec. In this creek is found

the Paso de la Cienaga which is only two leagues distant from the village of Jaltipan; and in this same branch of Mistan is the pass of Blancos, at a distance of 21 kilometres from the large town of Acayucam, the capital of the district.

The branch Apotzongo is 40 kilometres long, and on its right bank, 29 kilometres from Horqueta, is the village of San Miguel de los Almagres (or Hidalgo-titlan), the first inhabited place met with proceeding down the river. Below this point the water in this branch is constantly 6 to 7 metres deep; but a little above los Almagres between the strands of Mistan-grande and Gaviota, it is impeded by a considerable shoal.

After the junction of the two branches, the Coatzacoalcos receives on its right the rivulet Ishuatepec, the stream of Otapa, and the river Coachapa, the mouth of which is 16 kilometres from the lower end of the island of Tacamichapa. The source of this river is unknown, and the district it traverses is a desert; it has been ascended in canoes for twelve days, which is the same time as that employed in going up from the bar of the Coatzacoalcos to the pass of Sarabia, and schooners have also sailed up it to a sugar plantation 12 kilometres above the entrance. At a spot three leagues higher up, it receives the river Coachapa, which, as already mentioned, collects the waters that leave the Coatzacoalcos at the turn of Cascajal. The stream Otapa comes from some small lagoons producing salt in abundance.

Seven kilometres below the confluence of the Coachapa, but on the opposite shore, is the village of La Fabrica or Mina-titlan; and at seven more below this, the river Uspanapan joins the Coatzacoalcos by its right bank.

Half way between the river Coachapa and Mina-titlan is situated on the left bank in front of an islet, the common

entrance to the creeks Tacojalpa, Ojozapa, and Cuamecatan, in which the pine logs destined for the arsenal at the Havannah were formerly deposited.

Of all the villages founded by Don Tadeo Ortiz, only Mina-titlan and Hidalgo-titlan now remain, and their situation is indicated on the map.

The Uspanapan is the most considerable of all the numerous tributaries of the Coatzacoalcos; its course is wide, spreading through an uninhabited country; and although its sources are unknown, they are generally supposed to come from a range of mountains, which is often visible to the S.E. from the upper part of the Coatzacoalcos. This range has the reputation of being rich in gold and silver minerals, and has been explored by several expeditions, which ascended the river in canoes for sixteen to eighteen days, and some of them are said to have done this even for twenty-six days. On the banks of this river, at 38 kilometres from its mouth, Mr. Baldwin of Mina-titlan built a schooner a few years since.

Below the Uspanapan, near a spot named Paso Nuevo, through which runs the high road leading to Tabasco, the rivulet of San Antonio joins the Coatzacoalcos, proceeding from some marshes 25 kilometres distant from its mouth.

Finally, at 16½ kilometres below Uspanapan, and 8½ from the bar, is found on the left the confluence with the river Tierra Nueva, or the Calzadas, this being the channel by which the Coatzacoalcos unites with the river Huasuntan, which empties itself into the sea by the mouth of the Barrilla, not practicable for vessels of any size.

The banks of the river here are very low, and frequently flooded, and there are many creeks; the most remarkable of which are that of Tacoteno, on the left bank, below Paso Nuevo, which reaches back to near Mina-titlan,

and that of Coatajapa on the right hand, which flows near the village of Yshuatlan.

The depth of the Coatzacoalcos, from the junction of the branches which form the island of Tacamichapa to the mouth of the Coachapa, is 8 metres, and from this to the bar not less than 10 to 12 metres. Its breadth, where narrowest, is from 120 to 150 metres; and in some places below the mouth of Tierra Nueva it is nearly 700 metres. It will therefore be seen that as far as the island of Tacamichapa, a distance of 55 kilometres (13 Mexican leagues nearly), or at least up to the confluence of the Coachapa, the Coatzacoalcos is navigable in all seasons and for every class of ships, forming a convenient as well as most secure harbour. Schooners might ascend as far as Horqueta by the branch of Mistan, and to Hidalgo-titlan and somewhat higher by that of Apotzongo.

From the battery on the left shore at the entrance of the river, a clear channel is to be seen through the break in the bar, which we were informed never varies in position; and although we knew well that there is a sufficient depth of water for large ships (since but a few years ago two large French vessels with colonists had entered the channel), we examined it ourselves in an open boat, going out to the distance of 3000 metres, where we found 15 metres water with a rapidly increasing depth. The shallowest water we found on the bar was 6.2 metres, and we were not certain that we had gone over the deepest part of it.* A North American pilot, who resides in the establishment of Mr. Baldwin, assured us that he had

* When we reached the greatest distance from the land, the rusty shanks of the rudder of our boat broke, and this compelled us to return immediately, without taking any other soundings, as we had intended.

many times crossed the bar, and that he had never found less water upon it than 21 English feet, equivalent to 6.4 metres. This account nearly agrees with our own observation, and confirms the old opinion that the bar does not shift, a circumstance easily explained, since the current of the river is slow, and the tides are almost imperceptible at its mouth.

In the vast and dense forests which cover the shores of the river and its tributaries, the finest ship-building timber as well as dyewoods are to be found in profusion; those principally seen in the greatest abundance are the tall pine trees of the Sierra de Chimalapa; the noble cedars which line the length of the river especially above the stream of the Perlas; superb mahogany, and other hard and close-grained trees, such as Javicues, Huayacanes, Macayos, and Paques, from the latter of which curve and fashion timbers were cut in the time of the Spanish government for vessels of the largest dimensions.

The abundance of ship timber which is to be found on the borders of the river itself, the convenience and security of the port, the facility of defending its entrance by placing batteries at the points of the river facing the channel, and which from the nature of the ground might be rendered unassailable from the land side, are all so many combining circumstances to render *the Coatzacoalcos the fittest place in all the gulf of Mexico for the establishment of an arsenal*. These advantages were first pointed out to the Spanish government by the engineer Cramer, in the year 1774. In 1778 another engineer, Don Miguel del Corral, submitted to the Viceroy a plan for the construction of an arsenal, with two building slips for vessels of every size, and a fort to defend the entrance of the river.

In making our survey we descended the river in canoes from the Paso of the Sarabia to its mouth : from the confluence of the Chimalapilla to that of the Sarabia we floated down on rafts ; and, in laying down the course, we determined astronomically the latitudes of five points. The intermediate places were observed by compass, estimating the distances by the time employed in passing along them, which was the only method we could adopt, owing to the matted state of the forest along the banks ; and in those places where some of the loops made by the river approach each other in the branch of the Apotzongo the ground was examined on foot by paths which we had to cut for ourselves.

Not being enabled to determine by observations the position of the mouth of the river, we have adopted that laid down by the Spanish naval officers.

In concluding this description of the river Coatza-coalcos, I trust I may be allowed to record my grateful acknowledgments to my worthy relative Don Joseph Gonzalez, captain of the general staff, who accompanied me on the survey of the lower part of the river, lending every possible assistance to be expected from his activity, talents, and experience, and from whose premature death his country suffered so severe a loss.

In continuation I subjoin the account of the astronomical observations which were taken in the isthmus, as literally given to me by Captain Robles.

ASTRONOMICAL OBSERVATIONS.

By these the latitudes of eleven places and the longitude of Juchitan were determined, and many azimuths taken.

The instruments employed were Borda's repeating circle, of 0^m35 diameter, constructed by Gambey; the reflecting circle, by Cary, of 0^m20 diameter; two sextants, one by Gambey, of 0^m20 radius, and the other, by Cary, of 0^m15 radius; and two chronometers, by Roskell, No. 171 and 301.

Observations at Juchitan.—The latitude was determined with the greatest care by circummeridian altitudes of various stars, and that of the Polar star taken out of the meridian, using the circle of Borda for these observations as well as for the altitudes of the sun and of several stars noted for the purpose of regulating the chronometers. The observations here given will show the degree of confidence which may be placed in the calculation of the mean rates.

6 Circummeridian altitudes of Fomalhaut			
(November 3, 1842)	16°	26'	15"N.
20 of the Polar Star (November 3)	16	26	6
12 of ϵ Grux (November 4).....	16	26	6
12 of Achernar (November 4)	16	26	14
8 of Canopus (February 18, 1843)	16	26	3
2 series of 6 observations of the Polar star out of the meridian.....	16	26	9
<hr/>			
Mean of these 70 observations	16	26	8,3
Difference of the place where the instrument was situated and the apex of the cupola of the church	0	0	1,7
<hr/>			
Latitude of the cupola	16	26	10
<hr/>			

Not having had the opportunity of observing the occultation of any star by the moon, the longitude was determined by culminations of one of its limbs with the stars Spica Virginis, Antares, and Regulus, observed by the

telescope of the circle placed nearly in the plane of the meridian, and the following results were obtained :

Longitude of Juchitan, West of Greenwich.

By comparison with Spica (February 17).....	6 ^h 20' 27"
Id. with Antares (February 21)	6 20 50
Id. with Regulus (March 13)	6 20 43
Id. with id. (March 14)	6 20 34
<hr/>	
Longitude of Juchitan.....	6 20 38,5
In degrees	95° 9 37,5

From the roof of the church, on the 2nd, 3rd, and 4th of November, 1842, several series of angles were observed by the theodolite between one of the limbs of the rising sun and the signal at Umalalang, to determine the azimuth of the latter ; and noting the time by one of the chronometers, the rate of which was well ascertained, it gave 48° 44' 30" from south to east.

San Mateo del Mar.—The latitude of this village, deduced from a series of ten circummeridian altitudes of the moon, taken by Mr. Moro with Cary's sextant on the 16th of August, 1842, is 16° 12' 47", which differs only 7"5 from that obtained by the triangulation.

San Dionisio del Mar.—The latitude of this place was determined by three series of circummeridian altitudes of the sun, giving the following results :

1st Series of 20 observations (October 11, circle of Cary).....	16° 16' 36"
2d Series of 16 observations (October 13, by circle of Gambey)	16 16 22
3d Series of 22 observations (October 16, circle of Cary).....	16 16 30
<hr/>	
Mean of the 58 observations	16 16 29,8

The latitude, taken graphically on the plan at the spot laid down from two secondary triangles, gives $16^{\circ} 16' 32''$.

San Juan Guichicovi.—On the 7th of February a series of ten circummeridian altitudes of the sun was taken with Cary's circle, and the latitude deduced from these was $16^{\circ} 58' 35''$. On the morning of the same day, and on the previous evening, azimuths were astronomically taken of various points visible from the church and a small neighbouring hill, of which the longitude was ascertained to be $4' 15''$ west of Juchitan.

The remaining seven latitudes of places determined by the Commission are those of Santa Maria Chimalapa, Hidalgo-titlan, Mina-titlan, Paso de la Puerta, the strand of Jumuapa, the south point of the island Pedernal, and the Horqueta de Tacamichapa; the first by six circummeridian altitudes of Sirius, the second by eight of the sun, and the others by simple meridian altitudes of the sun, taken with the sextant of Gambey. These latitudes will be found with the former in table No. 1*.

In addition to the above, several azimuths were obtained at various points corroborative of the observations taken at Juchitan.

Observations of the temperature and atmospherical pressure were also noted at the same time, the whole of the calculations being made with the greatest care and exactness from data furnished by the British Nautical Almanack.

The Commissioners regret that the observations were not more numerous, especially in that part of the country where the triangulation was most difficult; but even such as have been made were only obtained by the most arduous labour. From the frequency and force of the northerly

* Vide Appendix A.

winds it became impossible to use the artificial horizon, and consequently the reflecting instruments; and even Borda's circle was employed with much difficulty, on account of the continued heavy rains which fell on the mountains at the season of the year when this survey took place. Three successive attempts were made to determine the latitude of Santa Maria Chimalapa. The two first proved quite unsuccessful, having in one instance fruitlessly waited eight days for an opportunity to effect our purpose; and even on the third occasion five days elapsed before we could accomplish our object. At many other places we also waited in vain for favourable weather to make our observations.

Throughout the whole of these labours, I was greatly assisted by the lamented Captain Gonzalez, whose ardent zeal could not be restrained even in the midst of rapidly declining health.

GEOGRAPHICAL POSITIONS OF THE TRIGONOMETRICAL POINTS.

The azimuth of the signal at Umalalang, observed from the cupola of Juchitan, with the latitude of this latter point, served for the calculations of the geographical positions of the vertexes of the principal triangles found in Table No. 2.

In these calculations, as well as in the trigonometrical levels, and the construction of the maps, the value of the terrestrial ellipticity has been assumed at $\frac{1}{288}$ as deduced by La Place from the influence which our planet exercises over the moon's motion, and which differs but little from $\frac{1}{287}$ which has lately been found by Mr. Puissant to result from the several geological operations.

The longitude of Juchitan having been determined astronomically, and this point made the basis for all the other positions, their longitudes have been referred to it both in the table and in the maps.

LEVELS TAKEN TRIGONOMETRICALLY.

The altitudes above the level of the sea, contained in Table No. 3, have been calculated by zenith distances observed with Borda's circle from the summits of Daniguiati and Palo Blanco and the church of Juchitan, and from the horizontal distances derived from the triangulation. At Daniguiati, a series of ten observations of the horizontal depression of the sea was taken, and by them the height was determined to be 274.5 metres above it, allowance being made for the height of the tide at the time of observation.

The height of Juchitan was ascertained by the preceding, and by two series of observations at that place, and two more at Daniguiati; that of all the following points as far as Palo Blanco were determined by observations made at Juchitan.

Lastly the height of Palo Blanco, and the zenith distances observed from its summit, served for finding all the points.

Not less than six series of observations were taken at each time for determining the heights; and for the most important as many even as twenty-four.

In order to calculate the co-efficient for the refraction, meteorological observations were made, which being applied by the prescribed formula (see the *Geodesie de Puissant*, 3^{me} edition, liv. 3^{me}, par. 271) gave the following results:

Values of the co-efficient for Refraction.

For observations made at Daniguiati ...			0,0715
"	"	Juchitan	from 0,0723 to 0,0727
"	"	Palo Blanco	from 0,0684 to 0,0716

It must be observed that the situation of the highest peak of the Sierra having been laid down by means of sights taken from distant points, which in consequence of the peculiar form of the mountain may not always have been directed to the same spot, there may be an error of position amounting perhaps to 1,000 metres, which would also occasion another of 45 metres in the altitude.

LEVELS TAKEN BY THE BAROMETER.

The Commission simultaneously took levels with the barometer, using two constructed by Cary well compared together, and the results are stated in Table 4.

The height of the three first points have been ascertained directly from the level of the sea, by comparing those of Umalalang and Daniguibixo with the result of the geodætical measurements. In both cases we found only the small difference of two metres, the trigonometrical height of Umalalang being less than that given by the barometer, whilst in the case of Daniguibixo it was the reverse.

The height of the Venta de Chicapa is the mean of four series of observations differing but little from each other, which were made simultaneously at that place and at Tarifa, and this last is included in the geodætic levelling.

All the other places, with the exception of the four last, which we took separately, were ascertained by simultaneous observations made at each of them and at Tarifa or the Venta; and those of greater importance by two series at least. The altitudes of San Miguel Chimalapa and Chivela were calculated respectively from each other,

and the results were without any sensible difference, equal to those obtained by means of simultaneous observations consecutively made at each of these places and at Tarifa.

All the isolated observations were eventually compared with the means of those previously and subsequently made at the Venta.

On verifying the different results the Commissioners are of opinion that barometrical observations determine the *differences* of levels very approximately, when made with due precaution. It is above all things requisite to study well the nature of the country to ascertain the most favourable circumstances for making observations, since the form of the land separating two stations may impede the equalization of atmospherical changes, and thereby produce considerable errors.

The north wind, which frequently blows over the isthmus, brings with it the clouds formed in the Mexican Gulf, and these are discharged upon the low grounds of the Coatzacoalcos, towards the northern side of the Sierra and its principal summits, whilst above the opposite slope and over the plain, which extends from the foot of the mountains to the shores of the Pacific, the sky remains constantly clear. If under these circumstances barometrical observations are made simultaneously on both sides of the Sierra, on the side of the Gulf they will exhibit a lower elevation than the true one, the error being the greater as that station may happen to be lower down or more towards the north; but if time should admit of waiting until the weather be equally fine on both sides (which seldom happens) then the difference between the levels of the barometrical columns is insensible. Hence we are unable to give the altitudes of many places where observations were made.

The considerable difference existing between the altitudes determined by us and those given by General

Orbegozo ought to excite no surprise, since he himself says "that the observations made do not deserve perfect confidence, since he had reason to suspect that a small quantity of air had got into the only barometer he possessed, and which he had himself constructed." And although he says afterwards, that he "endeavoured to correct the results indicated by his barometer in subsequent observations made at Tehuantepec previously to and after driving out the air from the tube by boiling the mercury in it," nevertheless this correction was unquestionably less than that which was necessary, in consequence of all the air not having been totally expelled, which seems indicated by the circumstance that the differences between his results and ours are always greatest when the altitudes are lowest.

Besides, as the General had only one barometer at his disposal, he may probably have calculated his differences in the heights by taking the mean altitude of the barometrical column at the level of the sea as determined by Humboldt, by which method an error might arise of 30 metres, since we have noticed differences in the barometer at the level of the sea, observed at the same hour of the day, of 0^m 0055, half of which difference would suffice to produce the before-mentioned error in the height observed, so that in this way no survey, such as the isthmus requires, could be relied upon. However, this is taking the error at a maximum, but supposing circumstances to be otherwise favourable, this method is still very valuable as a means of extending the knowledge of the physical geography of such countries in which great differences of heights are found at short distances, for the error of 30 metres would not much signify. We have ourselves adopted its application at various points of the journey from Tehuantepec to Puebla, as noted down in Table 5.

GEOLOGY OF THE ISTHMUS OF TEHUANTEPEC.

From the commencement of the works I perceived the importance of obtaining some accurate information on the nature of the country which was the object of our investigations, and I began at once to collect specimens of the rocks in the several points which we explored. However, I considered the utility of this operation in a scientific point of view of much less importance than the influence which the quality of the rocks might have in the constructive part of the work, that is, as regards the species of building materials they might yield, and the greater or less facility with which they might be excavated.

The collection having acquired by degrees considerable bulk we were induced to classify it. Professor Don Andres del Rio, well known in the scientific world, kindly lent us for this purpose his valuable assistance, without which, indeed, it would have been beyond our powers to accomplish.

Captain Robles undertook to write the memoir annexed to the geological map, which is here inserted literally.

GEOLOGICAL DESCRIPTION.

The great cordillera of the Andes or the Sierra Madre in this isthmus gradually becomes narrower and diminishes in height; its direction is nearly from east to west, and parallel to the coast of the Pacific, nearer to this than to the Gulf of Mexico, so that the natural division of the waters is about seven times more distant from the latter than it is from the lagoons of Tehuantepec.

Northward of the upper lagoon the Sierra is divided at its narrowest part by a longitudinal valley, through which the rapids of Guichilona and Masahua run, and

extending from the base of the Cerro de la Banderilla to between those of Piedra Parada and Rinconchapa; both slopes of the Sierra are precipitous, and that on the north terminates by a flat table-land, 200 metres above the level of the sea. The north side of this plateau gradually descends, and imperceptibly unites with the plain through which the Coatzacoalcos winds its course. Westward and eastward the Sierra again widens, and rises to a great height. From this plateau, which we have called La Mesa de Tarifa, a descent may be effected to the Pacific either by the gap (Portillo) of the same name, or by that of La Chivela.

The principal rocks in these mountains are milk-quartz, granite, sienite, greenstone, argillaceous porphyry, grey-wacke, primitive limestone, slate, hornblende schist, grey-wacke schist, compact limestone, and claystone. The stratified rocks are so much broken up and disturbed by the plutonic, and so intermixed with them, that their respective relations are with difficulty discernible.

In the narrow part of the Sierra the nucleus is of milk-quartz, which forms the elevated valley of the Guichilona and the Masahua and the Mesa de Tarifa, disturbing the beds of the stratified rocks, mixed up with the fragments of the quartz which has insinuated itself into the fissures. Quartz also appears in the mountains of Palo Blanco and Zapata, in some of those near San Miguel Chimalapa, and in the road from this village to the Cofradia, and it extends apparently to the west; but to the east at no great distance it entirely disappears.

The quartz is generally shattered, and in cracks even when found in detached pieces: sometimes there are blocks of granite imbedded in it, as is the case near Tarifa and in the descent through its gap towards the plain. (Vide geological map).

The boulders brought down from the upper Coatzacoalcos show that the nucleus of the eastern part of the Sierra consists of granite and sienite, and some pieces are of dioretic porphyry; the latter and the sienite are sometimes found on the slopes of the Sierra, piercing the sedimentary rocks, as may be seen between Niltpec and Zanatepec, where the sienite is to be found. In the descents from Guichilona and Chihuitan and the gap of the Chivela the slate and limestone are cut through by the porphyry.

The argillaceous porphyry forms to the east the Cerro Atravesado intercepting the valley in which the river of Chicapa runs from east to west, and some little hills at the foot of the Sierra near to the town of Niltpec; also to the west it forms the hills of Guichicovi and Xochiapa and probably the other high hills of this range. On these hills the porphyry is accompanied by common grey-wacke: near Guichicovi and Niltpec magnetic iron is also found in great abundance.

Slate is seen covering a considerable space, overlaying the quartz and mixed with it in the glens of the Masahua and the Guichilona, on the plateau of Tarifa, and in the neighbouring hills; and isolated in the less disturbed strata to the eastward along the Sierra. It is sometimes talcose, and now and then similar to pearlstone, although when submitted to the blow-pipe by Señor del Rio, he found it to be silicate of alumina. Alternating with it are the grey-wacke schist, and a rock of slaty appearance composed of the same substances as the greenstone, called hornblende rock by Lyell, and greenstone schist by Del Rio.

Grey-wacke is abundantly found in the descent of Guichilona and in the hills near Barrio and Petapa. Greenstone appears in this vicinity on the summits of Guievixia and the peak of Almoloya; on the heights of

Zapata and Palo Blanco it is mixed with quartz, and it is found repeatedly on both sides of the valley of Chicapa, and on the southern slope of the Sierra to the east. The schist is talcose on the rise from Niltpec to the Cerro Atravesado, and on the hanks of the upper Ostuta; and it resembles pearlstone in the Cerros de Espinosa and Paso Partida, and in the adjoining hills.

In the road from Guichicovi towards the Paso de la Puerta, the older formations are wanting, and quartz and slate reappear.

Compact limestone rests upon the slate, and is also very abundant: it forms the Cerro of Huacamaya, Prieto, Masahua, del Convento, and several others; it is found on the Mesa of Tarifa, along all the south side of the Sierra, on the slopes of Laollaga, and it appears several times in the road from San Miguel to Santa Maria Chimalapa in those places where the sand and claystone have been cut through by the water courses. Having greater consistency than the schist, the limestone slabs have not been reduced to fragments in the same manner as the former, nevertheless they are much dislocated and incline in different directions; sometimes they are nearly vertical, forming inaccessible mountains, such as Cerros Prieto, Masahua, and Convento. In the last-mentioned there are two caverns, in the smaller of which the stream Monetza takes its rise: this same stream penetrates the larger one, and passes through it, on its way to join the river Chicapa. The limestone (sometimes stinkstone) is traversed by veins of calcareous spar and pearl spar, in some of which fragments of diorite are met with; it is an excellent building marble, of a smoky and sometimes of a yellowish and blue ash colour, whilst the limestone of the Cerros of Laollaga is dolomitic.

Not far from the Sierra near the village of San Geronimo

the limestone is pierced by veins and fragments of hypersthene, and forms several hills, amongst which the brook of Zopiluapa takes its rise.

This limestone formation is the same as that found in the centre of the republic on both sides of the great chain, wherein the celebrated cavern of Cacahuamilpa is situated, and which also at Tasco rests upon the same argillaceous and talcose slates as in the isthmus, and this formation is further traversed by metaliferous lodes. Baron Humboldt has designated it alpine limestone (*alpinkalkstein*.)

The limestone is immediately followed by the sandstone found in Guievichi on the southern side between Niltpec and Zanatepec; in the hills of Piedra Parada and on Banco del Marques; also occupying a considerable space on the same side of the Mesa of Tarifa; and on the opposite side in the Cerros of Chichihua mingled with quartz, and extending on the one hand towards Santa Maria Chimalapa, and on the other towards Guichicovi where it lies upon the porphyry, of which the hills are formed, and now and then upon grey-wacke schist.

When the sandstone is wanting, claystone is then in contact with the porphyry. It is found upon the sandstone between the hills of Guichicovi, Xochiapa, and Gavilanes, and in the road to Santa Maria Chimalapa, and it appears to occupy all the intervening space, but from its greater susceptibility of decomposition it frequently disappears, leaving bare the sandstone beneath.

This last rock, which at a little distance from the Sierra, forms also the hills of Yztaltepec (or Daniguiati) and that of Lagartero, appears to have been upheaved by the hypersthene rock, at the same epoch as the limestone of the hills of Zopiluapa.

In general the sandstone is argillaceous and has a slaty

texture, but it is also at times quartzose, as in Daniguiati. The clay slate in the road to Santa Maria Chimalapa passes into jasper, and the boulders found in the bed of the river Coatzacoalcos sometimes indicate this transformation.

In addition to the rocks above-named, compact quartz, quartzose and calcareous breccias, and common and variegated marls, are occasionally found. The compact quartz is in layers beneath the slate in the descent from the Portillo de Tarifa, and on the banks of the Ostuta; the sandy marls lie over the sandstone; common marl is found on the slopes of the Sierra and on the road from Niltepec to Zanatepec; and the variegated marl on the Mesa de Tarifa hills.

On the borders of the Coatzacoalcos rolled pieces of micaceous iron of excellent quality are seen, and also in great abundance in the brooks near Tarifa, so that in all probability the formation is near the estate of that name, perhaps in the slate rock, and evidently very rich.

The compact limestone of the Cerros of Masahua is overlaid by a stratified limestone dipping but slightly, which extends from the source of the salt stream Tolistoco as far as the foot of the Cerro of Rinconchapa, and which, to distinguish it from the former, we have called new limestone in the map.

The upper river Coatzacoalcos traverses a valley of alluvium, in which all the rocks above named successively appear. Between the confluences of the rivers Chimalapilla and Milagro are seen the primitive limestone and sandstone, but very rarely slate; thence to the river Coatzacoalcos appear the greenstone and primitive limestone; and in the great rapid at the ancient shipping station of Mal Paso, the primitive limestone rock rests upon granite. The plain through which the river continues its course to the

Gulf of Mexico, is covered by a thick coating of rich mould deposited by the river and its numerous tributaries, and the small knolls on the banks are layers of clay.

On the other side of the Sierra a plain extends to the lagoons and to the Gulf of Tehuantepec, over which are dispersed several hills that will be noticed when speaking of the islands in the upper lagoon. This plain is covered generally by alluvium of quartzose sandstone, underneath which are layers of clay, alternating with others of fine sand, indicating that at some period the sea washed up to the base of the Sierra. The clay is sometimes on the surface, and at other times at a depth of 12 metres.

Near the Cerros de Masahua rises in the plain a spring called La Agua Caliente, which is surrounded with calcareous tuffo. Its heat is $31\frac{1}{2}^{\circ}$ centigrade, or ($88\frac{1}{2}^{\circ}$ Fahrenheit), and it contains a small quantity of sulphuretted hydrogen.

North of the lagoons there is a small Sierra terminated by the Cerros Tinayix and Prieto. The Cerros of Zopilote and La Cienega also appear to belong to the same range, which, with the Cerros of Buena Vista, Tumactiacxilans and Uniacxial, near the lagoon, appear to be of grey-wacke and argillaceous porphyry, and occasionally jasper.

The islands of Mitiac-ix and Arrianquiambah are also formed of very fine grained grey-wacke, whilst the island of Mitiac-xocuen is of porphyry, with a jasper basis.

Trachitic porphyry, with small veins of chalcedony, is found in the Cerro of Camotepec, or Dani-gu, to the westward of the upper lagoon; and in the hills of the Potrero, which lie between this and the lagoon, the highest is formed of porphyry, and the remainder of jasper.

The hills on the two peninsulas, which separate the

lagoons, and those of the other islands, are principally composed of greenstone in layers, pierced by veins of fine grained granite, or by dykes of dioritic porphyry. Granite dykes are found in the hill near the estate of Santa Teresa, in that of Jianstanuc, and in the island of Cerro Prieto; and, when in contact, the greenstone alters to the appearance of basalt, changing to dioritic porphyry on the summits of Umalalang and in the island of Manguix-tiac. The greenstone in the Cerro de Huaxtoco is intersected by bands of tremolana, and under it grey wacke schist, slates, and slabs of prase. The same formation occurs in the Cerro de Maloxuet, on the other side of the canal. On the southern slope of Maloxhuet there is an argillaceous conglomerate, and on that of Umalalang is found a conglomerate of fragments of diorite.

The layers on the two sides of the canal of Santa Teresa having opposing dips, as well as those of the islands of Cerro Prieto and Viagtiac, clearly show the action of an uplifting force in the direction of the canal; and although no plutonic rock is discoverable in it, yet between the two islands appear those of Monapostiatic, with an elevation of 111 metres above the level of the sea: these, with another smaller island, are all composed of irregular blocks of sienite, 6 to 8 metres long; which formation can only be explained, as it immediately occurred to Mr. Moro, on the supposition of the fused materials becoming contracted by cold.

It only now remains to notice that part of the Sierra which begins near the sea-shore by the Cerro del Morro, and runs towards the north-west, and the Cerros of Tehuantepec, Huilotepec, and San Francisco, which are all composed of granite and sienite.

In the chain of the Morro and in the Cerro de la Cueva is found a porphyritic feldspar, with bands of oxide and

hydrate of iron, which is sometimes greatly modified by heat. The Cerros del Tigre (or Dani-qui-bedchi), near Tehuantepec, are of dioritic porphyry, traversed by large dykes of sienite; and the Cerro Baxmumbah (near San Francisco) is also of dioritic porphyry, but pierced by a granite dyke, the latter again crossed by granite of a more recent formation.

In the other Cerros of San Francisco, granite and sienite are mixed, and appear to pass one into the other. The Cerros of Huazontlan are of graphic granite, and in those of San Diego and Huilotepec (or Dani-gui-bixo) the sienite is fine grained, accompanied in the latter by a formation of quartz and albite.

In concluding this description we must observe that a more complete study of the geology of this interesting part of the Cordillera would have required the exclusive attention of the Commission, which had other objects of more immediate interest to accomplish. In presenting these results of our observations we have to claim the indulgence of those persons who can well appreciate all the difficulties attending investigations of this kind. Whatever merit they may possess is in a great measure due to Professor Don Andres del Rio, who willingly undertook the task of classifying the specimens obtained in the isthmus, and we therefore take this opportunity of conveying to him our grateful acknowledgments for his valuable services.

The preceding statement closes the account of the labours of the Commission in the isthmus. I have considered it necessary to enter into a minute detail of them, in order to give an idea of the degree of confidence to

which the results obtained are entitled ; but it will, however, be readily admitted that I might have been much more minute in the details had I wished to enhance the value of my efforts.

For the same reason I have abstained from extending the plan herewith presented. The Commission, fully impressed with the importance of their mission, did not wish to assert any thing on mere conjecture, nor to be guided by report which so frequently proves erroneous. They would not, in fact, venture a single assertion beyond what they could affirm to have seen and investigated by their own observations. In so doing they acted in accordance with the wishes of the projector, Don Joseph de Garay, who conceived the undertaking with the grandeur it deserved, nor would they otherwise have accepted the trust with which they were honoured.

The public, to whom this report is addressed, may therefore trust the correctness and fidelity of the assertions which it contains, ascribing only to inefficiency whatever errors of calculation may have been committed, but by no means to a want of zeal and conscientious diligence on the part of the Commissioners.

PROJECTS.

AFTER what has been said in the preceding pages, the facility with which the plan proposed by Don Augustin Cramer might be carried into effect becomes evident. Thus, by conveying to Tarifa the united waters of the Almoloya and Citune, it would be easy to direct them on the one side towards the Atlantic, and then join them on the other to those of Chicapa, either by proceeding across the valley of Monetza, which Cramer does not mention and probably did not know, or by descending along the brow of the hills to the east of the Portillo of Tarifa.

At certain seasons of the year the rivers Almoloya and Citune have a more abundant supply of waters than that which we have mentioned; but even by gathering them into reservoirs constructed on purpose, they would only supply a canal of small dimensions, and therefore of limited utility. Let me therefore be permitted to give my opinion on this subject.

The various plans which I am about to submit, are formed on the supposition of the Coatzacoalcos being rendered navigable as far as its confluence with the Malatengo, and the Boca barra of San Francisco fitted for the admission of large vessels. Both these ends are, in my opinion, attainable without having to overcome extraordinary difficulties.

The favourable and useful peculiarities of the Coatzacoalcos soon attracted the notice of its early discoverers. Cortes, speaking of the country of which the isthmus forms a part, says :

“ I had heard that in a very great river which runs through the said province and falls into the sea, there was an excellent harbour for vessels ; because Ordaz, and those who accompanied him had examined it, and as the country appeared particularly fitted for colonization, and there being on this coast such scarcity of harbours, I was desirous of finding one, and establishing there a settlement.”

Subsequently, by order of Cortes himself, Ordaz founded the town of Espiritu Santo, four leagues from the mouth of the river, of which only some slight traces now remain.

No one ever visited the Coatzacoalcos, whether acquainted with these matters or not, without being impressed with the facility with which the whole of it might be made navigable.

The stability of its bed is owing both to the slowness of the current, which prevents its excavating the bottom and banks, and to the clearness of the waters, which carry no materials down to make new deposits. The gentleness of the current may be inferred from the fact that its course, with all its windings from the confluence of the Malatengo to the sea, measures 258,000 metres, with a fall of only 40, namely, 0,000155 of descent for each metre of course.

It has been observed that the bar of the Coatzacoalcos is permanent, and in the plan of its course, raised in 1825 by General Orbegozo, we find, after a lapse of eighteen years, that the same windings exist throughout. The islets and streams are also identical both in number

and importance, which seem to promise that whatever works may be necessary to give greater depth to the river will have a permanent result if they are well conceived and properly executed.

The usual engines might be used, as well as the power of the river itself, by narrowing temporarily its bed more than necessary. This object might be effected by means of dikes constructed with solid piles, taking advantage for the purpose of the useful materials which nature herself offers profusely in the large trees and excellent clay that cover the banks of the river.

In some parts of the upper course of the river it may perhaps be necessary to straighten its course, checking the increased current by means of a lock, and in others to construct solid embankments so as to limit the width of its bed; but any attempt to determine at present the number and magnitude of these works would only evince either want of good faith or presumptuous ignorance.

To change the established course of a mighty river is one of the most delicate operations in hydraulics, and requires not only much skill and tact, but a careful study of local circumstances, which cannot be the result of a single inspection, but rather a series of assiduous preliminary labours.

I cannot, however, look upon the difficulties as very great, for I am thoroughly convinced that they would be neither arduous nor expensive to overcome. The two most difficult points are the rapids of the old and the new Mal Paso, where the river runs upon a rocky bed; but these are of limited extent, and the many efficient means employed in similar cases are too well known to allow of much importance being attached to such obstacles.

With these two exceptions the remaining rapids are

generally caused by shingle and sand-banks, and diminish gradually in number until they become very scarce below the river Jumuapa.

After passing the small hill of Cuapinaloya, the Coatzacoalcos divides itself into two branches called Apotzongo and Mistan. If the former of these were straightened, compelling at the same time the whole of the waters of the river to run through its channel, and obstructing the entrance of the other arm, the shoal of Horqueta would be removed, and the river become navigable for large vessels to a point beyond Cuapinoloya, namely, more than 100 kilometres from the mouth of the Coatzacoalcos.

Before dismissing this subject, I think it necessary to make one other observation. The various authors, who have spoken of the Coatzacoalcos, differ in their statements as regards its depth,

Dampier states it to be	14	English feet.
Cramer „	18	Castilian feet at mid-tide.
Orbegozo „	14	Castilian feet.
Robinson „	22	English feet, and more in the rainy season.
The last Commission	6,40	metres, or 21 English feet.

These apparent contradictions will disappear if we observe with Don Tadeo Ortiz that the bar has two canals, the depth of one varying at different seasons of the year from 18 to 23 feet, and that of the other from 12 to 15. It is not likely that all have measured the deepest canal, besides from the opportunity which I had of examining the plan of the soundings made by Cramer, I think I may with certainty assert that the bar has increased in depth.

If regulating the course of the Coatzacoalcos may be

productive of some trouble, there would at all events be very little in opening the shoal of the Boca barra of San Francisco, and giving more depth to a canal in the lakes, the bottom of which is nothing but mud and shingle.

These difficulties once conquered, nothing remains but to convey a sufficient quantity of water to an elevated point from whence it may be distributed and directed on the one side to the Coatzacoalcos, and on the other to the upper lagoon. Both objects may be attained by different means.

FIRST PROJECT.

This would be to open a trench that would lead the waters of the Ostuta to the valley of the Chicapa, and another which, beginning a little above the "Ultimo Rancho," would direct the waters thus collected to the table-land of Tarifa following the brows of the hills to the north of the valley watered by the Upper Chicapa and the Monetza. These two proposed trenches are shown in the plan of the southern part of the isthmus. The point of distribution of the canal would be placed between the Cerro del Convento and the estate of Tarifa, from whence it would descend on the one side to the Coatzacoalcos following nearly the natural course of the waters, and on the other would reach the upper lagoon descending along the eastern and southern sides of the hills of Masahua by means of proper locks. By the annexed geological plan it will be seen that the proposed canal would have to be cut through a soil formed in some parts of an argillaceous rock of excellent quality, and in others of marl, clayish sand, and slates. All these rocks are easy to excavate, and of sufficient consistency to

require no 'revestments. Now and then among the slate the quartz makes its appearance, but we have always found it so broken as to cause no uneasiness whatever.

General Orbegozo saw in the ordinary commissures of the slate a considerable obstacle, supposing that through them the waters might escape, hut it would not be at all difficult to remedy this inconvenience by stopping such joints as might require it both in the bed and sides of the canal with a good hydraulic cement, or still better, by taking advantage of the prodigious quantity of asphaltum found in the environs of Alvarado, which the sea is continually casting on the banks of the Coatzacoalcos, inviting with mute eloquence the industry of man.

The alluvial soil, which extends from the foot of the Sierra as far as the lagoons, being for the greater part sand, might offer another obstacle, were it not that the observations which were made in two different points at a considerable distance from each other in the grounds of the Venta de Chicapa, show that at four metres from the surface, that is, at a much less depth than that required for the canal, there is found a very consistent clay upon which might be erected the revestment walls and other necessary works.

No less firm is the earth that was lately found on opening a well in the village of Juchitan at more than eleven metres from the surface.

SECOND PROJECT.

The second combination, undoubtedly easier and more economical than the preceding, would be to direct to the Portillo of Tarifa, that part of the canal which goes towards the Pacific, and from thence along the brow of the hills to the east, join the canal to the river

Chicapa, which would be made navigable as far as the plain.

THIRD PROJECT.

Another idea occurred to me, which for a moment appeared very enticing ; it was that of converting into a lake the valleys of the Chicapa, San Miguel, and Monetza, stemming the united waters of the Ostuta and the Chicapa, and compelling them to rise to the level of the table-land of Tarifa. This new lake would form at the same time an excellent dockyard, and be the point of distribution of the waters from which on the one side they would descend to the Atlantic in the manner shown in the first project, and on the other side would follow the course of the river Chicapa then made navigable. This project, which would place a harbour in the midst of the Sierra, would offer the advantage of rendering unnecessary the excavation of the trenches intended to convey the waters of the Chicapa and Ostuta to Tarifa, but it would require the construction of a dike of extraordinary dimensions, and would have the further disadvantage of causing the connection of several locks, a circumstance that ought to be avoided, not only on account of the great consumption of water which they occasion, but of the consequent delay in the navigation ; and I have only been induced to mention it, in order to show that the ground lends itself to numberless combinations.

FOURTH PROJECT.

It would also be possible to place the point of distribution in the valley of the Monetza converted into a lake or basin. Near the point where this river joins the

Chicapa it passes through an opening between two hills so near together, that it would be possible to close them with a dike of less difficult construction than the one mentioned in the former project. From this basin the waters might be directed to the Atlantic by the way before explained, and towards the Pacific following the course of the Chicapa made navigable. This project would be less difficult to execute than the preceding, but it participates in many of its objections without offering so many advantages.

FIFTH PROJECT.

The plan which I am about to propose seems to me preferable to all the others in every respect, naturally and at once appearing the most simple and economical means of turning to account the topographical advantages of the ground. After having conveyed to the immediate neighbourhood of Tarifa the waters of the Ostuta and Chicapa, by the means shown in the first project, the next consideration would be to take advantage of the beds of the rivers, which from that point proceed towards both oceans, regularising their courses so as to make them navigable. The stream of Tarifa, and the rivers Chichihua and Malatengo, might be followed on the one side, and on the other the Monetza and the Chicapa.

It would not always be possible or convenient to follow the windings of the rivers, but by carefully observing the ground a considerable saving of labour might be effected in the work of excavation. The windings of the Monetza and Chicapa, judiciously turned to account, would give to the canal a more extensive line in which the locks could be better distributed. The solid rocks, through which these two rivers run, would afford both at the

bottoms and sides a firm foundation to the necessary works.

The Commissioners do not pretend to have indicated the *only* means of effecting the desired canal transit, much less do they flatter themselves of having proposed the best, and only hope to have been the means of showing the practicability of the undertaking. With regard to its advantages as a commercial speculation, the following estimate of the necessary expense will afford the best means of calculating them.

ESTIMATE OF EXPENSE.

I have arrived at the most difficult and delicate part of our labours. Dutens, speaking of the Caledonian Canal, which he visited before its completion, observes, that "in a great undertaking of this kind it is impossible to pre-estimate the cost of every part." And so it is: the amount of expense is mostly influenced by eventual causes, by the mode of husbanding the funds, and by the skill with which the engineer conducts the work.

If in Europe, where it is comparatively easy to obtain correct data in these matters, it is considered venturesome to name beforehand a sum as the probable cost of an undertaking of this nature, it must necessarily be more difficult to do so in the present case, from the want of the requisite particulars. However, by making use of proper investigations, and tending to over-estimate the expense rather than to diminish it, I trust to come near the truth; nor is it possible to expect more in our present disadvantageous position.

It would be an error to suppose that every portion of the work must, in our case, cost more than it would in Europe. The prodigious quantity of timber of the best

quality which the projector is authorised to use at pleasure, in virtue of the grant made to him by Government, and which lies profusely in every part through which the canal would pass; the excellent kinds of building stone, the lime, bitumen, clay and all other necessary materials which nature seems to have taken pleasure in scattering in the most convenient spots; and, lastly, the ground and the waters, the acquisition of which occasions often considerable expenditure, and which, in our case, if it did occasion any at all, would be so trifling as not even to be worth mentioning, are all advantages in favour of our undertaking, and which very few of the same kind in Europe could easily command.

I will not, however, take into consideration these advantages, supposing them to be counterbalanced by other circumstances, and shall therefore take as a guide in my calculations the cost of an analogous undertaking, generally admitted to have been exceedingly expensive by a combination of adverse circumstances. I will do still more: I will apply these calculations to my first project, which as I have mentioned may be considered as the least advantageous, and I will suppose the necessity of excavating the whole of the canal from the confluence of the Malatengo to the lagoons, without taking advantage of any of the favourable accidents of the ground.

The canal, which I have taken as a model, is the Caledonian, the dimensions of which appear to me sufficient. To alter them much would occasion a considerable increase in the expenditure, perhaps without a suitable compensation, whilst the alteration required in the dimensions of some of its parts for the admission of steamers destined to a transatlantic navigation, would not make it much more expensive.

Although the Caledonian canal measures less than

22 English miles of proper channel, if we add to it the cost of cleansing and deepening the lakes, it may be considered as 25 miles long, which is equivalent to about 40 kilometres. The declivity from the top of the canal is of a medium height of 29 metres on each side, and it has in all 27 locks.

From the statement in the *Encyclopædia Britannica* (7th edition, vol. 19, page 750) it would appear that the above-named canal cost up to 1822, when it was opened, the sum of £905,258, that is, somewhat under 22½ millions of francs; but as I find in other works that its total cost was £986,924, or nearly 24½ millions of francs, I will proceed with my calculation upon this last amount, although less favourable. The writer in the *Encyclopædia* has probably excluded from the total expenditure the cost of collateral works, such as bridges, roads, &c., which, strictly speaking, do not belong to the canal.

Each lock of the Caledonian canal cost, upon an average, 200,000 francs, and therefore the whole 27 amounted to five millions and a half.

Deducting this sum from the total cost of 24½ millions, it will appear that the 40 kilometres of canal cost, exclusive of the locks, 19 millions, and each kilometre 495 thousand francs.

Selecting the proper ground, the declivity of the proposed canal is :

From the table-land of Tarifa to the Pacific 200 metres.
From the same point to the mouth of the Malatengo... 160

Giving to it a number of locks proportionate to that of the Caledonian canal, there would be required :

On the side of the Pacific 89 locks.
On the side of the Atlantic 72 ditto.

Total number of locks..... 161

But the number of locks depend in a great measure on the accidental form of the ground; and, these permitting, there might be given to each lock a fall of three metres, in which case their number would be reduced

On the Pacific side to.....	67
On that of the Atlantic to.....	53
	<hr/>
In all	120
	<hr/>

However, to come nearer to the existing data, and because it might be necessary to put one or more locks below the confluence of the Malatengo, we will suppose that the total number of necessary locks is 150.

The longitude of our canal would be 80 kilometres.

The trench, intended to convey to Tarifa the united waters of the Ostuta and the Chicapa, would be about 25 kilometres in length, and we will give to the section of its excavations 40 square metres of surface. We will take 10 francs as the cost of excavating a cubic metre of ground, according to what is actually paid in Mexico and the United States for a similar work in soils analogous to that of the isthmus.

The trench necessary to join the Ostuta to the Chicapa might be five kilometres in length at the utmost, and allowing for unforeseen obstacles in this part of the country on account of the nature of its rocks, we will suppose it to cost three millions of francs.

Lastly, let us apply four millions more to regulate the course of the Coatzacoalcos and to excavate the lakes and the Bocabarra.

Then, summing up the preceding calculations, the total amount of the work will be found to consist of the following sums :

Cost of 150 locks at 200,000 francs	francs	30,000,000
„ 80 kilometres of canal at 475,000 francs		38,000,000
„ 25 kilometres of trench at 10 francs per cubic metre		10,000,000
„ 5 kilometres of trench at 15 francs		3,000,000
Regulation of the Coatzacoalcos, lakes, and Boca barra		4,000,000
Total cost.....	francs	<u>85,000,000</u>

IMPORTANT OBSERVATIONS TO THE PRECEDING ESTIMATES.

I said at the commencement that it was my intention to exaggerate the cost, and it cannot be objected that this promise has not been fulfilled in the preceding calculations; for not only have I laid aside the real advantages which the nature of the ground offers to the execution of the work, by adopting the least favourable project, but I have also fixed prices, certainly exaggerated, and by no means probable.

1. The trenches, which from the neighbourhood of Tarifa convey the waters of some torrent streams to the river Monetza with which they enter the valley of San Miguel, would decrease the work in the point of distribution.

2. I have calculated as having to open the whole of the canal, whilst, as we have seen, advantage might be taken of part of the beds of the rivers which run towards the two opposite seas from Tarifa.

3. Both the length of the trenches and the section of their excavation may be greatly diminished by constructing some dike across the valley of the Chicapa, and taking advantage of the favourable shape of the brow of the Sierra in some parts.

4. In the Caledonian canal it was found necessary to build a considerable number of bridges, whilst none are

required in our case, therefore it is evident that the average cost for each kilometre of canal which I have adopted is excessive.

5. It must have been observed that I do not pretend to attach any importance to the traditional notion of the existence of a lake, which gives origin to the rivers Ostuta and Chicapa; but if this were true (and it must be admitted that there is nothing impossible in the assertion) the union of the two rivers might probably be accomplished at their source, causing thereby an economy of some millions.

6. Among the expenses of the Caledonian canal there was a sum of £47,956; that is, more than a million of francs, paid for the acquisition of the grounds occupied. In the isthmus those which are not lay or waste lands, and therefore the only portion that does not belong by right to the projector, are so utterly insignificant as to their value that it is scarcely worth mentioning. It is indeed hardly possible to give an idea of the small value of the ground, even the most fertile in these vast and wild regions, and I will only say that if it were desirable to turn into a lake the valleys of Chicapa, Mouetza, and even that of the village of San Miguel itself, the amount of indemnifications to be paid would be considerably under any supposition that might be made in Europe, however underrated it might appear.

From all the circumstances just mentioned, and from the knowledge I have of the localities, I am authorised to infer that the preceding estimate may be considerably modified, and I do believe that if the most eligible project were adopted, the total amount of the work would not exceed 60 millions of francs; besides, the sale of a small portion of the fertile grounds granted by the government to the projector, and the valuable produce of the

country which from this moment might be turned to account, would procure annually no small portion of the funds requisite for the work. Neither would it be necessary to wait until its completion to establish a commercial communication between the two oceans; for the river Coatzacoalcos might soon be made navigable and the Boca barra of San Francisco fitted for use.

A lateral line of rails for the conveyance of merchandise might also be added to that which must at first be laid down for the progress of the work.

I hesitate not again to repeat that these projects, which are based on data still imperfect, may probably be not *the best* for the accomplishment of the desired object; but if any of them should appear admissible, it must be an inducement for the execution of a work, the peculiar circumstances of which must necessarily improve the conditions of the enterprise.

FORTIFICATIONS.

With the view of not leaving any part of my instructions unfulfilled, I will say a few words respecting the mode of protecting the canal against the insults of a foreign enemy ; but I will not go beyond general indications, as I had no opportunity of performing the topographical observations requisite for tracing out a plan of fortifications. The portions of the canal which it would be necessary to protect would be the two extremities.

On the north, the small fort called *Fortin de la Barra del Coatzacoalcos* was built by a Spanish contractor more than seventy years ago for the protection of some timber felling. It consists of a building somewhat resembling barracks, with an ill-constructed barbet battery on the left side of the river's mouth, and impossible to defend. In front it may be approached within pistol-shot unperceived, and on the sides it is completely exposed. As early as 1778, the engineer *Del Corral* proposed to substitute for it a small fort with four bastions.

Don Tadeo Ortiz was of opinion that the small hill on the opposite side of the river, which is more extended and healthy, and with waters always fresh, offered greater advantages for the construction of a fort.

At all events it would be advisable to occupy both places, although not with works of equal importance ; but the best protection for the harbour of *Coatzacoalcos* would arise from the facility of multiplying its defences by establishing batteries in appropriate places along the

course of the river which is admirably adapted for this purpose.

On the side of the Pacific, the upper lagoon when converted into a port, could readily be protected from the danger of an attack. On both sides of the canal of Santa Teresa might be placed formidable batteries protected by two forts conveniently situated in the Maloxuet and Huastoco ; and various islands scattered in the upper lagoon would afford the means of rendering it impossible to force an entrance.

I will lastly observe, that the government of Mexico having declared that the canal once effected should be neutral and free for all nations, the general interest of these alone would constitute its greatest and most effectual defence.

STATISTICAL NOTICES

OF THE ISTHMUS OF TEHUANTEPEC.

Although the topography of the isthmus has been hitherto but imperfectly known, the fertility of its soil and the salubrity of its climate have been long acknowledged.

These favourable circumstances were observed by the Spaniards even at the time of the conquest, and have been subsequently confirmed by the reports of all who have explored these interesting regions. Another great advantage in connection with them, is the certainty of obtaining at any time a sufficient number of workmen should any of the proposed plans be carried into effect, particularly as by a fortunate coincidence it happens that the most densely populated parts of the isthmus are precisely those where the most important works would have to be executed. Robinson, who knew well the locality, said in reference to this subject :

“ If, on a topographical survey of the isthmus, it shall
“ be found practicable to cut a canal, there is no place
“ where such an undertaking could be accomplished with
“ such ease, as in the province of Oajaca. In its boun-
“ daries are comprehended a great part of the isthmus of
“ Tehuantepec. Its salubrity is unequalled on the Ame-
“ rican continent ; even its shores on the Pacific ocean
“ appear exempted from the usual diseases which afflict
“ the inhabitants of the Atlantic and South Sea coasts.”

“The population of Tehuantepec are among the most active and healthy race of Indians we have ever seen, and the cutting of a canal through such parts of the isthmus, as an accurate survey shall show to be fittest for that purpose, could be performed with the greatest facility by the inhabitants of Oajaca.”

These most important advantages were also appreciated by Mr. Michel Chevalier, who lately visited America, and who, speaking of the isthmus, in one of his recent publications (*Revue des Deux Mondes*, January 1st, 1844), says :

“The exploration of General Orbegozo, confirmed the presence of a magnificent vegetation in the isthmus, which proves the fertility of its soil. Even previous to the voyage of Humboldt, the beautiful forests of Tarifa had attracted the attention of the court of Spain. The fertility of the extensive plain of Tehuantepec was also ascertained, no less than the healthfulness of the country at some distance from the sea. Besides it being well known that the isthmus was once densely populated, there seems to be no reason why it could not be so again.”

During the long sojourn of the Commission in the isthmus they had often to undergo hard and severe toils, and were frequently exposed to the most trying inclemencies of the weather, and yet neither themselves nor their numerous attendants experienced any illness indicative of an unhealthy climate. I shall in the following pages refer to these circumstances more at length.

I know how important it would be to give here an exact account of the valuable produce which constitutes the natural wealth of the isthmus, but as the paucity of my information on the subject, the difficulty of obtaining accurate data, and my fear of exceeding the limits which

I have prescribed to myself, do not permit me to enlarge upon the subject so much as its vastness would require, I must be content with making a few brief and necessary observations. I am for the same reason prevented from giving in full the report of the secretary Don Pedro de Garay, who especially applied himself to collect information on this point, but whenever I make use of any fact acquired by him, I shall not fail to mention it.

The isthmus of Tehuantepec belongs to the Mexican Republic, and forms part of the departments of Oajaca and Vera Cruz. According to the official reports, published by the Mexican Government in December 10th, 1841, as a basis for the elections, the former department contains a population of 500,278 inhabitants, and the latter, 250,380.

The boundaries of these two districts in this part of the Mexican territory are not yet definitively settled. The line of division is generally considered to coincide with the course of the river Sarabia, but this would only fix the limits on the left of the Coatzacoalcos, and by no means on the right.

This want of a defined boundary is a natural consequence of the present state of the country. The two extremities of the isthmus are the only inhabited portions, and they are separated from each other by an immense forest of astonishing beauty, which, from the richness of its natural produce, contains evidently treasures of incalculable value, but which with its luxuriance conceals the aspect and form of the hitherto unexplored soil, on which it stands.

To proceed methodically I shall divide the statistical

notice of the isthmus into two distinct parts, treating successively of the different branches which belong to each department, and beginning by the most southern, namely, that of Oajaca.

SOUTHERN DIVISION.

DEPARTMENT OF OAJACA.

This part of the isthmus is topographically divided by nature into two sections. The first occupies the plain which extends from the Pacific Ocean to the foot of the Sierra, and the second belongs to the Sierra itself.

Politically, the southern grounds of the isthmus constitute the greater part of the district of Tehuantepec, and comprise twenty-four municipalities; the town of Tehuantepec, which the Spaniards called also Guadalcázar, is the head of the district, and the residence of a prefect, a judge of first instance, a military commander, and a parish priest. Juchitan and Petapa are the heads of two sub-districts with their respective sub-prefects.

Ecclesiastically this portion of the isthmus is dependant on the diocese of Oajaca, and in addition to the parish of Tehuantepec has five rectories.

INHABITANTS.

The whole of the southern territory of the isthmus contains about 31,000 inhabitants, as may be seen in table No. 1, obtained by the researches of Don Pedro de Garay, who declares himself to be indebted for his information "to the zeal of the authorities, and to the accounts

"of trustworthy and unobjectionable persons," an assertion which gives to this document the required value and authenticity.

The population of the southern division of the isthmus is composed of Europeans, Huaves, Zapotecos, Mijes, Soques, and Zambos.

The *Europeans*, as regards numbers, constitute an insignificant part of the population, and are disseminated over various localities.

The *Huaves* are in all little more than three thousand, and occupy the four villages of the coast called San Mateo, Santa Maria, San Dionisio, and San Francisco.

These natives are easily distinguished by their aspect, which differs materially from that of the other inhabitants of the isthmus. They are generally robust and well-formed; some among them evince a high degree of intelligence, but the majority are so grossly ignorant as to differ little from a savage tribe.

According to their own traditions they are not indigenious of these regions: they pretend to have descended from the Peruvians; but from some idiomatical analogies, it is supposed by some persons that they originally came from Nicaragua.

During our residence at San Mateo, we thought we observed the Huaves celebrate a clandestine festival on the 21st of June, the day of the solstice, as was the custom with the Peruvians, and they appeared also to hold a feast the next new moon.

The Huaves say that in consequence of a disastrous war, they had to embark and fly from their own country. They all believe that they reached the isthmus by navigating along the coast, and that the first place they occupied was San Francisco, from whence they afterwards extended themselves.

Considerations of local interest keep these four villages, or republics, as they are called by themselves, in a state of constant warfare; and even the language has become so corrupt, that the inhabitants of the one village can scarcely understand those of another.

According to an ancient manuscript, obtained by the secretary of the Commission, the Mijes occupied the whole of the isthmus at the time of the conquest by the Huaves; but the former, after having offered some resistance, were finally conquered by the latter, and forsaking the plain they betook themselves to the mountains, which they still enjoy.

The Huaves of both sexes are habitually in a state of almost complete nudity. Their industry consists of little else than fishing, and even this they can only do by means of sweepnets: with the produce of their fisheries, however, they carry on an extensive trade, although not possessing proper vessels to venture into deep water, and being ignorant even of the use of the oar, they only frequent those spots which from their shallowness offer little danger, such as marshes, and the margin of the lakes and of the sea. It is a singular fact that although the Huaves are chiefly fishermen, very few among them know how to swim.

I have attended some of their festivals, the ceremonies of which still preserve the type of their ancient customs, and I regret that my limited space compels me to omit the description, and impart to others the lively interest with which they inspired me.

The *Zapotecos* constitute the greater part of the southern population of the isthmus, and almost exclusively that of sixteen villages out of twenty-four. According to the manuscript above-mentioned, as obtained by the secretary of the Commission, Montezuma, emperor of Mexico,

after subjugating the Huaves proceeded to the conquest of Guatemala, but whilst he struggled with the difficulties of the war, Cosijoesa, king of Teozapotlan and of the Zapotec nation, assisted by the king of Misteca, drove the Mexicans away, took possession of Tehuantepec, and maintained the Huaves in subjection.

The gallant defence which he afterwards made against the Aztec legions ended in a treaty of friendship, and Cosijoesa married a daughter of Montezuma, called from her beauty the *flake of cotton*. They had a son, Cosijopi, which signifies *thunderbolt of the air*, who reigned at the time of the conquest of Mexico by the Spaniards.

Cosijopi was baptized and received the name of king Don Juan Cortes de Montezuma. He was a magnanimous prince, generous to prodigality: it was by his command that the church and convent of Dominican friars was built at Tehuantepec, but it having been discovered that he had not entirely forsaken the worship of his original deities, he perished despoiled of his dominions and liberty.

Although Cosijopi did not offer any resistance to the Spaniards, the Zapotecos opposed their progress towards the interior. Cortes, speaking in one of his letters of two provinces which he intended to conquer, says:

“The people of one of them are called Zapotecos, and that of the other Mijes, which provinces are so rugged that they cannot be traversed even on foot, since I have twice sent troops to conquer them, and they have not been able to succeed, these people being very strong and well armed, and the country almost impassable.”

Even at present, whenever the opportunity offers, the Zapotecos maintain the fame for valour which they have always enjoyed.

The natives of Tehuantepec are by their civilization incomparably superior to those of any other part of the Republic, and their intellectual qualities are of no mean order. I have generally found them intelligent, industrious, docile, and joyous.

In point of personal appearance the Tehuantepecans are vigorous, and of a pleasing aspect, and I may say, that of the Indians with whom I am acquainted they are perhaps the only people who possess what may be called a *fair sex*.

It appears evident to me that these qualities are not inherent to the Zapotec race, but a consequence of their admixture with the Europeans; for I have observed that the Zapotecos, who inhabit the mountains, and the valley of Oajaca, are similar to the natives of the rest of the Republic, and bear no resemblance whatever to those of Tehuantepec, among whom there are many with light hair, and a complexion comparatively fair.

It is well known that Cortes had collected a great number of Spaniards in the isthmus, which was his favourite spot. The women of Tehuantepec enjoy some celebrity in the Republic for their charms; and the predilection which they show towards the Europeans, together with a rather over degree of sociability, render this supposition very probable. While speaking of the women of this part of the isthmus I will add, that they are also noted for their graceful carriage, and the regularity of their features: their gala-dress is picturesque, rich, and elegant, as well as the head-dress which they generally wear.

On the coast of the Pacific there grows in great abundance a kind of rush called *chintule*, the roots of which have a pungent aromatic odour. An infusion of these roots imparts their fragrance to the water, which the

people of Tehuantepec use as a luxury highly esteemed, both for the purpose of washing the wearing apparel, and for their personal ablutions.

A description, though imperfect, of the manners and customs of the Zapotecos, who inhabit this part of the isthmus, would require more space than I can now devote to the subject; I will therefore only add, that they are not without some branches of industry. In Tehuantepec, in particular, there are bakers, carpenters, smiths, tinkers, silversmiths, tanners, shoemakers, saddlers, and as the secretary of the Commission observes in his notes, every family, whatever may be their circumstances, manufacture the soap necessary for home consumption. The clothes woven by the women from wild silk and cotton are really admirable, particularly considering the very imperfect instruments which they possess for the purpose.

The *Mijes* constituted formerly a powerful nation, and they still occupy the land from the Sierra, north of Tehuantepec, to the district of Chiapas. In the isthmus they only inhabit the village of Guichicovi, and a small portion of the Sierra, which is never visited.

Physically and morally speaking the *Mijes* are a degraded race, of a repulsive aspect, and most grossly ignorant. They are, however, given to agriculture, and they grow plantains, maize, beans, and sugar-cane, from the latter of which they extract an impure kind of sugar, and they may be said to supply with these articles the southern division of the isthmus.

A favourite object of the ambition of the *Mijes* of Guichicovi is that of possessing the greatest possible number of mules, a circumstance not easily accounted for, considering that they make no use whatever of these animals, not even for the carriage of their goods, which they prefer carrying on their own shoulders.

The Mijes are notorious idolaters, and they frequently pollute the altars of the catholic temples with the blood of birds which they offer as victims to other deities.

According to the information collected by Don Pedro de Garay, the number of these people is about 5000; but Don Tadeo Ortiz, I do not know upon what authority, calculates at twice that number those who profess idolatry. For my own part, seeing that they attend the Catholic service not only without reluctance but even with apparent pleasure, I feel persuaded that they have in their minds an absurd combination of the religion of Christ with their ancient superstitions.

The *Soques*, who came originally from Chiapas, inhabit in the isthmus only the villages of San Miguel and Santa Maria Chimalapa. They are easily distinguished from the other inhabitants of these regions by their peculiar features, but I can scarcely tell whether their appearance is more or less unpleasant than that of the Mijes.

In point of morality the *Soques* appear somewhat more rational than the Mijes; and contrary to these they are naturally kind and obliging, so much so, indeed, as to become tiresome with their obsequious offers.

It appears that formerly they occupied also the village of Chimalapilla, which stood on the banks of the river of the same name, one of the confluent of the river del Corte. According to tradition the population of this village was completely destroyed more than a century ago by the small-pox, and the few inhabitants who survived the epidemic joined those of Santa Maria.

It is the general opinion, supported by historical record, according to Don Tadeo Ortiz, that at the time of the conquest by the Spaniards there passed near Chimalapilla a road which connected these districts more directly than they are at present, with Tabasco and Chiapas; but

my observations respecting the nature and form of the Sierra induce me to doubt the accuracy of this assertion.

The *Soques* cultivate the scanty supply of maize required for their own consumption, a small quantity of tobacco, and two plants belonging to the family of the *bromelias*, from which they extract the *iztle* and the *pita*, the fibres of which they can bleach, weave, and dye of different colours. Their spun materials, and the hammocks which they weave with them, constitute their chief industry and commerce.

The inhabitants of Santa Maria extract also some annatto, and supply the whole of the southern part of the isthmus with the delicious orange, which grows abundantly about their settlement.

The *Zambos*, a half-cast between the Indian and the Negro, are chiefly found in the estates of the Marquisate del Valle, and also mixed with the Zapotecos in the villages of Zanatepec, Niltpec, Petapa, Barrio, and Santo Domingo.

The *Zambos* descend from the African slaves introduced in the Marquesanas estates by the successors of Cortes, and in the Frailescas possessed by the Dominican friars in the territory of Zanatepec. They are robust and industrious, working as labourers in the fields, and applying themselves to the cultivation of wheat, indigo, and cochineal. Unfortunately neither the *Zambos* nor the other natives of these districts are remarkable for their sobriety.

CLIMATE.

The climate of that portion of the country, which in this part of the isthmus extends from the shores of the Pacific to the foot of the Sierra, is in general warm

and dry, a circumstance to which no doubt it owes its salubrity.

The heat is not equally intense in every part of the plain. Tehuantepec, situated in a sandy ground, open to the south and encircled on every other side by hills which prevent the approach of breezes, the coolness of which mitigates the heat of a burning sun, is without doubt the hottest spot in the isthmus. We have often seen the centigrade thermometer at seven o'clock in the morning rise to more than 33° (92° of Fahrenheit.)

Zanatepec is also subject to excessive heat in consequence of the proximity of the mountains which shade it on the northern side. The other villages, especially those near the sea, being at a greater distance from the mountains, are freely exposed to the northern winds which blow almost incessantly in these regions, and they consequently enjoy a much milder temperature. The winds proceeding from the north, being as it were confined within the great valley formed by the interruption of the grand chain of mountains between Tarifa and Petapa, descend with considerable force through the openings in the gaps of Tarifa and Chivela. The Venta de Chicapa, situated opposite the former, receives these currents at times very impetuously, and they are also often felt by travellers on arriving in front of the Portillo de la Chivela.

The climate of the elevated section of this part of the isthmus is so different from that of the plains, that when the thermometer stands in the latter place at 30°, it scarcely rises to 13° at Chivela or Tarifa. In all the heights surrounding these estates, we find the pine *ocote*, the presence of which clearly indicates a very temperate climate. This considerable difference of temperature appears much more strange considering that the absolute

elevation of Tarifa is not more than 200 metres, whilst its latitude is less than 17°. Our surprise ceases, however, when it is remembered that Tarifa participates in the temperature of the Sierra, which, near to it, reaches suddenly an elevation of more than 2,300 metres.

The summits of the Sierra Madre are almost constantly enveloped by the clouds, which coming from the Atlantic there discharge themselves, a circumstance that accounts for the rivers of the isthmus having an almost constant body of water during the greater part of the year. At Guichicovi and Santa Maria Chimalapa it rains almost incessantly, and often also at San Miguel. Whenever such is the case the table-land of Tarifa is covered with a kind of thin mist, which disappears upon reaching the Portillo where the reigning wind becomes more powerful. This phenomenon may be considered permanent, the suspended mist rarely extending beyond the table-land of Tarifa. Thus the Venta enjoys an almost constant unclouded atmosphere, and rain seldom falls in the plains.

In conclusion I will observe, that among the advantages offered by the isthmus of Tehuantepec for the execution of the proposed work, that of a mild and healthy climate, precisely in those localities where the assistance of European workmen would be required, is by no means the least considerable. The small rains of Tarifa and of the valley of San Miguel are not of sufficient consequence to impede the continuation of the work during a considerable portion of the day.

NATURAL PRODUCTIONS.

At the commencement of our exploration, it was my intention to have formed a collection of the more remark-

able plants and animals of the isthmus, but I soon perceived that so vast an undertaking would require the assiduous co-operation of several naturalists, and was moreover incompatible with the labours which constituted our principal object. My information upon this subject is therefore very limited, and in submitting the following observations to the public I have to solicit the indulgence of the well-informed reader.

MINERALS.

Our geological collection will give a sufficiently clear idea of this department of my subject. Iron is found in abundance in many points of the isthmus, and that of Tarifa especially appears to be of excellent quality. As regards the precious metals, which made the department of Oajaca once so famous, there is a tradition still prevalent from the time of the conquest that the mountains of Mijes and the upper Uspanapan contain very rich gold and silver mines. It may be well to observe here, that besides the hot-water springs already mentioned in the geological section there is another which we did not visit, in a place called Aguas Calientes (hot waters) at a distance of 25 kilometres west of Tehuantepec.

VEGETABLES.

The mangrove tree (*rhizophora mangel*) of sinister omen is not so common on the coasts of the isthmus as on others of the republic. In the southern division, it can only be found in the neighbourhood of San Francisco and of the Morro.

In the peninsula of San Mateo and Santa Maria the most remarkable plants are the tamarind, the palm, and

the cocoa-nut trees, besides which the ground is also covered with vegetation. Three different species of the sensitive plant are here found in abundance, one of which attains to nearly a metre in height.

The land to the north of the lower eastern lagoon, in which the estates of the Huaves of San Dionisio and San Francisco are situated, appear clothed with a luxuriant vegetation somewhat resembling that of the parks in Europe. The flowers in some of these localities are of astonishing beauty.

Between the coast and the Sierra the plain is partly covered by acacias, which, as we shall presently see, might furnish a considerable quantity of gum.

On approaching the Sierra the vegetation is more vigorous, and the Brazil-wood tree (*cæsalpinia crista*), of which considerable fellings might be effected, becomes very common. The granadillo, the mahogany tree, (*svictenia mahagani*), the copalchi (*croton cascarilla*) the bark of which is a well-known febrifuge, and the dragon-tree (*pterocarpus draco*) begin to make their appearance as well as many other shrubs unknown to me that yield resins and balsams, to which the natives ascribe the most marvellous virtues. There are also the fustic (*morus tinctoria*), and according to Don Tadeo Ortiz, the log-wood (*hæmatoxilon campechianum*), as well as a considerable number of other trees both picturesque and useful for their flowers and the hardness and durability of their wood.

Both the soil and the climate are favourable to the cultivation of indigo and the sugar-cane, and those tracks of land which are protected from the winds produce cotton of superior quality.

The table-land and hills between Tarifa and the Barrio appear covered with good grass which affords an excellent

pasturage for cattle. The dales are peopled with palm-trees, and a little higher up, we find the ocote pine (*pinus religiosa* ?) which has some affinity with the *pinus picea*. The latter tree is also found on the summits of the hills between the above mentioned places and Santa Maria Chimalapa alternately with the tropical plants which grow in the lower portions of the ground.

It is impossible to describe with effect the luxuriance of the vegetation in the latter places; but among the prodigious multitude of plants, however, the *guayacan* (*diospyros lotus*), the cedar, the mahogany, the rose-wood, the *gateado*, and the ebony, are particularly abundant. No less worthy of notice are the amber-tree (*liquidambar styraciflua*), from which is extracted the resine of the same name, and the tree yielding the balsam of Peru (*myroxylon peruiferum*), and the ocozotl producing a gum very similar to the true amber.

Innumerable species of fruit trees also luxuriate here, among which are found two kinds of vine bearing fine flavoured grapes, the plantain, the orange tree, two species of spontaneous cocoa (*theobroma cacao*) and the sapota tree of various kinds. The abundance of these is so considerable, especially that of the mammee sapota, that the Indians are accustomed to cut down the tree to gather the fruit more readily.

There are likewise several kinds of indigoferas; the *bixa orellana*, from which the annotto is extracted, the sarsaparilla (*smilax salsaparilla*), the ginger (*amomum zingiber*), and two kinds of vanilla, very common, and of which no use whatever is made. This precious plant is also found in great abundance on the hills west of Petapa.

The Cerro Atravesado has on its summit a table-land, at the northern extremity of which rises an isolated peak.

It is covered with excellent pasture grass, and a splendid wood of ocotes. The fissures by which this table-land is intersected are constantly supplied with delicious water by the frequent rains, and when these are considerable, the superabundant water falls perpendicularly over the western side, forming a cascade nearly one thousand metres in height. The edges of the fissures are richly ornamented with zamias, ferns, and orquidaciæ of great beauty.

The southern side of the most elevated portion of the chain appeared to me profusely covered with majestic oak trees.

To the right of the upper Coatzacoalcos, or river del Corte, are found in astonishing abundance various kinds of pines, and among them it would appear is the *pinus abies* which the Spanish Government used to send to the dock-yard at the Havannah for the construction of ship-masts. According to Don Tadeo Ortiz many of these trees are from two to four metres in diameter, and of a prodigious height; they are found at the very banks of the river. The plains watered by the rivers Malatengo, Chichihua, and Almoloya (the latter of which takes in its lower course the name of Guelaguesa) are noted in the isthmus for their delightful aspect. When speaking of the exploration of these rivers I have alluded to this fact, and therefore I will now only add that the vegetation in them is similar, and perhaps even more luxuriant than that of the low grounds on the road to Santa Maria. The soil and climate are likewise peculiarly adapted to the growth of maize, coffee, cocoa, tobacco, rice, and the sugar-cane.

On the road from Boca de Monte to the Mal Paso the vegetation begins to assume an aspect peculiar to the plains of the Coatzacoalcos. The *laurus sassafras*, the fern tree, an infinite variety of palms, and the plants

of the tropical regions already alluded to, united and interwoven with passion flowers, and innumerable filamentous reeds, or richly enveloped and crowned by a multitude of exquisitely beautiful orquidaciæ formed an admirable and sublime spectacle. But the peculiar characteristic of these shrubberies is, that the plants concealed in the midst of this luxuriant vegetation appear desirous to reach as soon as possible an elevation where they may enjoy the rays of the sun, thus acquiring an extraordinary height, and their stems being remarkably straight.

The Sarabia also runs through groves and woods of great beauty, the soil of which seems to be waiting only for the helping hand of man to yield with profusion the natural riches it contains.

ANIMALS.

In every one of the different estates of the isthmus a *tigrero* (tiger-man) is kept, who with a numerous pack of hounds is exclusively engaged in destroying the wild beasts that cause serious damage among the herds of cattle, notwithstanding the immense number of deer, hares, and rabbits on which they could and do also prey. As soon as the dogs discover one of these animals they set off in pursuit, and soon compel him to climb a tree for protection, where he is quickly despatched by the *tigrero*'s rifle.

The wild beast most common in the isthmus is that which is improperly called a tiger by the inhabitants of the republic, it being in reality the ounce (*felis uncia*); after this comes the American lion or puma (*felis discolor*): they are both numerous, although I have never heard of their attacking man, probably because they have other prey in abundance. The ocellots

or small tiger (*leopardus paidalis*), the wild cat, and particularly the American fox (*vulpes fulvus*) are also very numerous in the isthmus; but their skins are not turned to any account by the natives.

The most remarkable animal in this country, in proportion to its size, is the tapir (*tapirus terrestris*), which is found in great numbers in the upper course of the rivers Chicapa and Ostuta, as well as all the wild spots of the Sierra affording good pasture and an abundant supply of fresh water. The flesh of this animal has an agreeable taste.

In the upper Ostuta there are also considerable herds of wild cattle, proceeding no doubt from those which escaped into the woods from the old estates called Frailescas.

In the river just mentioned, as well as in all the others above named, there are a great number of martens of a particularly beautiful species.

In this part of the isthmus two kinds of the hog are very common, one called the wild boar throughout the Republic, although it bears no resemblance to the animal known by this name in Europe; the other, the pecari, *dicotyles tayacu* of zoology. The male has on the back a gland that contains a fetid humour, but its flesh, especially that of the female, is delicious food.

The woods are peopled with an immense number of monkeys of the genera *lagothrix* and *ateles*.

The deer, rabbits, and hares are innumerable in the isthmus, and the quantity of the latter which are constantly passing by the traveller in the plains of the southern coast is almost incredible.

From what has been already said of other animals, the abundance of the feathered tribe in these regions will naturally be inferred. Of these the crax alector,

improperly called pheasant; the wild turkey (*meleagris gallo pavo*); the chachalaca (*ortolida garrula*); the partridge, the quail, the wild pigeon, and ducks of various kinds are particularly remarkable.

Among the birds the most deserving of attention for their beautiful plumage are those of the parrot kind, the toucan, and on the shores of the lagoons the *platalea ajaja* of a beautiful rose colour.

Among the reptiles are found the guana, the flesh of which is considered by the natives delicate food. Unfortunately too there are also the most dangerous kind of serpents, such as the rattle snake (*crotalus horridus*), the coral coloured, and many others.

The lagoons, the rivers, and the ocean contain a variety and quantity of fish truly astonishing, as well as a considerable number of tortoises of various kinds. The divers of other coasts are in the habit of coming to the neighbourhood of the Morro in quest of the valuable tortoise-shell, coral, and pearl, which these coasts contain in abundance. The natives of Tehuantepec find also near the Morro a kind of purple shell-fish, from which they extract a substance which is much in use among them as a dye. The monstrous alligator inhabits the lakes near the coast, contaminating with its unseemly presence the beauty of the scenery.

Lastly, of the natural products of the country those yielded by the insects of the isthmus ought not to be overlooked. The most remarkable of these are the honey and wax with which the bees fill the woods, and the enormous bags of raw silk suspended by small worms from the branches of trees which the women of Tehuantepec turn to no small account.

INDUSTRY.

Were it not already an established axiom that the want of communication renders totally useless the territorial wealth of a country, the following account of the scanty and miserable annual produce due to the industry of the natives of the isthmus, compared with the exuberance of their natural productions, would be sufficient to prove it.

A road which extended from the coast of the Pacific to the navigable portion of the Coatzacoalcos, opening a communication between the two seas, has been twice established, and both have been periods of prosperity for the isthmus. This took place first at the time of the conquest, and subsequently towards the end of the eighteenth century. At present scarcely any vestige remains of these ancient roads, and the isthmus lies in a waste and unproductive inertness. The following observations will show the actual state of their scanty resources.

AGRICULTURE.

Table 2, due to the zeal of Don Pedro de Garay, exhibits the private landed property existing in the southern part of the isthmus.

"The estates," says Señor Garay, "which more particularly deserve attention, both for their extent and for the improvement of which they are susceptible, are those called *Haciendas Marquesanas*, from being entailed in favour of Hernan Cortes, Marquis del Valle, whose descendants enjoyed them up to a late period."

These estates are situated between the Barrio de la Soledad and the course of the rivers Malatengo and Chichihua, the stream of Zopiluapa, and the river del

Cazadero. At present they belong to Messrs. Guergue and Maqueo, merchants of Oajaca, the former a Spaniard and the latter an Italian.

The produce most in requisition with all the inhabitants of the isthmus, and in general of the whole Republic, is maize, of which they make the *tortillas* (small cake), and which is their principal food; but the want of roads to facilitate its conveyance causes the inhabitants to grow only as much as they require for their own consumption, which is little enough, as, besides their natural frugality, the woods and rivers furnish them with an abundance of provisions.

The Indians of Guichicovi are the most active cultivators of maize; but the harvest, which in proportion to the quantity sown they reap in great abundance, is due much more to the fertility of the soil than to the intelligence or art of the cultivator. Tehuantepec and San Miguel are the only places in the isthmus where I have seen the maize plantations artificially watered, a proof that these two towns are somewhat more advanced in agriculture.

Some attention is also paid in this part of the isthmus to the cultivation of the sugar-cane. There is a sugar factory in the neighbourhood of Chihuitan, belonging to Messrs. H. Gobert and Olivier Gourjon, the former a German and the latter a Frenchman. According to the note taken by Don Pedro de Garay, this establishment founded but a few years ago, can yield 50,000 kilogrammes of sugar, representing there a value of 45,000 francs, and 20,000 francs more for the brandy distilled from the molasses.

“Should the plantation and cultivation of the sugar-cane (adds Señor Garay) receive the encouragement of which they are susceptible, this estate alone might

“supply the sugar requisite for the consumption of the whole district of Tehuantepec, which may at present be considered to amount to about 125 thousand kilogrammes.”

Señor Garay observes that these are not the only plantations of sugar-cane existing in the isthmus, and that the Indians of Guichicovi especially manufacture an impure sugar, used for the confection of brandy. This spirit is chiefly distilled at Tehuantepec, Juchitan, and Itzaltepec. Señor Garay estimates at 40,000 francs the total value of the brandy consumed in the southern part of the isthmus, to which he thinks ought to be added 30,000 francs for the *mescal*, a kind of brandy extracted in those places from the leaves of the American agave.

The most important agricultural produce in this part of the country is that resulting from the cultivation of indigo. Upon this point the secretary of the Commission remarks :

“It is of such excellent quality as to be in request in all parts of the Republic, and it is also exported abroad. An average crop will produce about 60,000 kilogrammes, representing a value of 600,000 francs. Its cultivation demands scarcely any attention, as the plant continues to be productive for the long period of three years. It has been often calculated that the expense of the cultivation of indigo in fruitful years, before it acquires its perfect growth, does not exceed 3,75 francs per kilogramme, whilst its value is never less than 10 francs.”

“The settlements where this important cultivation is most flourishing are Juchitan, Itzaltepec, San Gerónimo, Chihuitan, and generally throughout the whole districts of Tehuantepec.”

After the indigo, the *ixtle* and *pita* are among the most considerable productions, but I am without sufficient

accurate information to venture an assertion respecting their true value, which is also the case respecting tobacco, annatto, wax, honey, and wild silk.

It is well known that the cochineal insect of these parts is the best in quality of any known, but its cultivation is almost entirely abandoned. Gum is so abundant, that according to the assertion of Señor Garay the neighbourhood of Juchitan alone will furnish 300,000 kilogrammes, each valued at about 0,25 francs.

CATTLE.

Formerly numerous herds of cattle grazed in the southern division of the isthmus. Don Tadeo Ortiz says that in the Frailescas estates alone there were more than 30,000 head of horned cattle, besides a considerable quantity of horses. At present there are not more than 1500 of the former, and only a few hundreds of the latter.

Table No. 2 shows that the whole of the black cattle in this district amounts to some 44,000 head, one-fourth of this number occupying the Marquesanas estates. The only utility derived from this cattle is almost exclusively limited to the use of its flesh and the sale of hides. It will easily be surmised that the consumption cannot be very considerable, since the population is so scanty and poor.

To complete this brief notice respecting the cattle, I will only add that according to the memoranda of the secretary of the Commission, the number of horses and mules may be estimated at 25,000, and that of the sheep at 1500. No use whatever is made of the hides.

FISHERIES.

The shrimp and dry fish prepared by the Huaves in the four villages of the coast, besides providing for the con-

sumption of the inhabitants of the country, are sent in rather large quantities to Oajaca, and other points of the Republic, but in this also I am without sufficient information to form a correct estimate of their value.

The tortoise-shell, coral, and pearl are of no utility whatever to the inhabitants of the isthmus, who never apply themselves to this kind of fishery.

SALT PITS.

Upon this point also I cannot do better than extract the observations of the secretary of the Commission, who after remarking upon the great importance which these salt pits might acquire, says :

“ They are so numerous, that it would be difficult to determine the quantity of salt they yield ; but from a proximate calculation, made with the assistance of some well-informed persons, their produce may be estimated during the period when they were worked on account of the government at 35,000 kilogrammes ; and it may be asserted with truth that the whole of their produce was not turned to account, since it is no exaggeration to say that from Huamelula to Tonalá the entire intervening space is one continued salt mine.

“ This salt is highly esteemed in various parts of the Republic, both for its purity and its whiteness. The principal consumption takes place in the departments of Chiapas and Oajaca, the annual produce derived from it being about 200,000 francs. This salt was sold at the public administration of Tehuantepec at six francs per kilogramme, and somewhat less when sold in the works themselves. Its cost to the government was not more than 1 franc 25 cents. for every 100 kilogrammes ; since being of spontaneous formation, and not requiring

"any operation whatever, the expense was limited to the
"mere carriage from the works to the place of deposit."

MANUFACTURES.

Those for which the inhabitants of the isthmus are more distinguished are leather-dressing and harness-making. At Tehuantepec and Juchitan doe-skins are prepared of any colour required, and with a degree of skill which entitles them to the high repute they have attained. Other kinds of skin are also tanned there, and the sole-leather and dressed ox-hides of Tehuantepec are much esteemed. Shoes and saddles manufactured of them are occasionally sent to Guatemala and the interior of the Republic.

Finally, another produce of the industry of the inhabitants of the isthmus consists in cotton stuff, woven with an admirable degree of fineness, considering the imperfection of the looms employed for its manufacture. These goods are also to be reckoned among the few articles of commerce.

ANTIQUITIES.

The southern division of the isthmus is particularly rich in antiquarian remains.

1. The road which leads from Mexico to Tehuantepec, on arriving in front of the Mistequilla, crosses a defile overhung by an eminence, called in the Zapoteco language *Guiengola*, which means large stone. In the historical manuscript, which I have often quoted, it is observed that when king Cosijoeza began his struggle for dominion against the emperor Montezuma, he made on this hill, which he had previously fortified and well supplied with

arms, ammunition, and provisions, the brilliant defense which secured to him the sovereignty of these lands. It appears that in those times there were in the hill several springs of water, of which not the slightest trace now remains; but there are still to be seen, as I have been informed, splendid ruins of fortifications and vast barracks. There is no doubt whatever of the existence of these ruins, and the Commission intended to have visited them had not other duties of more importance prevented it.

2. The hill of Coscomate, near Zanatepec, is also called hill of *the sun and moon*, from two colossal representations of these heavenly bodies carved in the solid rock, which are described as illustrated by an inscription in unknown characters. The name of Cerro del Venado (deer hill) is likewise attributed to an effigy of this animal being hewn out of one of the rocks.

3. The old men who accompanied me in one of my expeditions to the upper Ostuta, pointed out to me the situation of a valley about nine miles east of the Cerro del Venado, where they found the remains of a large town with buildings of stone. None of these spots were visited by the Commission.

4. Any object which has been shaped by nature into a fantastic form is considered as *enchanted* by the inhabitants of the isthmus. Thus they designate with this epithet the caves of the Cerro del Convento and of the upper Chicapa, the Cerro Atravesado, the problematic lake of Ostuta, and, above all, the island of Monapostiac, more generally known as the *Enchanted Hill*.

In the manuscript just alluded to it is mentioned that king Cosijopi at the beginning of his reign offered up a solemn sacrifice to the greatest idol of the Zapotecos, called the *Heart of the Kingdom*, which was placed in this island.

From the commencement of our operations I fixed upon the highest point of the Monapostiac as the vertex of one of the first triangles of the trigonometrical net. The intelligence of our determination to proceed thither and fix upon it a signal caused the greatest astonishment and terror among the natives. A furious storm was sure to rise on our nearing the island, and our loss was considered inevitable.

Nor is it to be wondered at that these ignorant people should entertain superstitious ideas respecting this island, since the formation of it naturally excites considerable wonder, even in the minds of the well-informed. From the summit to the base, which lies in the waters of the lake, it is composed of huge blocks of green sienitic stone, confusedly thrown one upon another, as if a heap of rubbish; and when these stones are struck together they emit a sound not unlike that of a large bell. I have in the geological section ventured an hypothesis upon the singular structure of this island, supposing that it came out in a state, if not of positive fusion, at least one of incandescence, and that it broke into pieces by the uneven contraction of the matter caused by the surface, from being exposed to the air, cooling sooner than the centre. The movement of the successive strata might afterwards have displaced the upper fragments, giving to the whole its present aspect. I may be mistaken in this supposition; but it is, however, that which naturally occurs on seeing the Monapostiac, and its irregular formation appears difficult of explanation in any other way.

The idols which were found in this island are of terracotta, and have been deposited in the national museum of Mexico. Their character is very different from those made by the Aztecs, and some of them are not without artistical merit. Unfortunately during their removal they

were broken in such a manner as to prevent the possibility of joining the fragments.

We were assured that the island of Tilema possesses also several objects of archæological interest, and that in the island of Arrianjianbaj, which signifies old city, the remains of an abandoned small town are still to be seen. These two points have not been visited by the Commission.

NORTHERN DIVISION OF THE ISTHMUS.

DEPARTMENT OF VERA CRUZ.

This portion of the isthmus belongs to the district of Acayucam, which was formerly one of the most densely populated of the Mexican empire.

The Commission having limited their operations in these parts to the exploration of the river Coatzacoalcos throughout its course, can offer but little statistical information as the result of their own observations; some data, however, which I possess, and on which the most implicit reliance can be placed, will enable me to supply this deficiency.

Besides the information afforded by the writings of Don Tadeo Ortiz, the government of Vera Cruz published, in 1831, the statistics of their own territory, and Don José M. Iglesias edited with accuracy and tact the portion relating to the district of Acayucam. Since 1831 the condition of this country has considerably improved, as may be inferred by the buildings now in progress in the chief town of the district, as well as by the flourishing plantations of cotton and tobacco, not one of which existed at that time, but which have since acquired some importance. Adhering, however, to my determination of asserting only that which I can in some way prove, and

not being aware that there are any other documents published more recently, I shall extract from them the necessary information.

Our topographical knowledge of these regions, where forests of immense extent and almost impenetrable thickness render the work of exploration difficult, is necessarily very limited. It is, however, particularly characterised by the course of the Coatzacoalcos, with which we are already acquainted, and we know likewise that the ground on both sides of this river is watered by streams of scarcely less importance, the waters of which might be advantageously employed to facilitate the communication between this fertile territory and the adjacent districts.

Don Tadeo Ortiz, comparing the Coatzacoalcos with the rivers Mississippi, Bravo, Panuco, Papaloapan (now Alvarado), Tabasco, Magdalena, and Orinoco, shows the preference to which it is entitled, particularly as regards their respective bars. He asserts several times that the waters of the Coatzacoalcos are always clear "even in the greatest floods," to which ought to be added the additional advantage of there being no logs of timber to obstruct its course, although it runs through a continuous forest, this favourable circumstance being undoubtedly owing to the gentle current and the tenacity of its banks.

After the river Coatzacoalcos, the next in importance is the Uspanapan, which according to Ortiz "runs through a pleasant and picturesque region of temperate climate, and once thickly populated." This region, he thinks, is that which Cortes and Clavijero called Chimatlan and Quiexula.

"It is very probable," says Ortiz, "that this district, which is now deserted, may afford a short and regular transit to the beautiful plains in the centre of the

"isthmus, as the conquerors penetrated through it into
"the Upper Tabasco and Guatemala."

Besides the Uspanapan, the rivers Coahuapa, Coachapa, San Antonio, Tancochapa, and Zanapa, water also the plains lying on the right of the Coatzacoalcos: all of them are more or less navigable, and the latter discharges itself into the Atlantic, about 40 kilometres eastward of the mouth of the Coatzacoalcos, through the bar of Toneladas, which the mariners of old mention in their writings as a frequented port, and which is well worthy the attention of modern navigators.

The territory west of the Coatzacoalcos is also intersected by mighty rivers, among which the Jaltepec and the San Juan are the most remarkable. The former, which as we have seen joins the Coatzacoalcos, runs through a country remarkable for its magnificent vegetation; and Ortiz is of opinion that a great portion of its course might be navigable for steamers. The latter falls into the Atlantic by Alvarado, and the Acayucans follow its course, when going to Vera Cruz, between which port and the Coatzacoalcos it is asserted that a water communication might very easily be established.

In the district of Acayucam there are sixteen municipalities, but I do not exactly know the number of political divisions, these being now different to those of 1831.

The town of Acayucam, situated at about 17° 50' 30" north latitude, and 0° 5' 45" east of the meridian of Juchitan, is the head of the district of the same name, and the residence of a prefect, a judge of first instance, a military commander, and a parish clergyman.

Acayucam, before the conquest, was the court of one of the most powerful caziques among the tributaries of

the empire of Mexico. Cortes, however, diminished its importance by founding the town of Espiritu Santo, which during one hundred and thirty-six years was the capital of the province; but the latter having subsequently been abandoned by its inhabitants in consequence of the frequent pillages to which it was subjected about the middle of the seventeenth century, Acayucam recovered a small portion of its former importance.

The district of Acayucam, as regards the ecclesiastical division, belongs to the diocese of Oajaca, like the rest of the isthmus, and has three parish churches and a vicarage.

INHABITANTS.

The tables formed upon the data afforded by the statistics of Señor Iglesias show that the population of this district, even if we suppose it not to exceed that of 1831, amounts to 21 thousand inhabitants, divided into *Europeans*, *Indians*, and *Mestizos*, or mongrels.

The *Europeans* are a limited number, and chiefly occupy themselves in commerce and the public administration of affairs.

The *Indians* constitute more than three-fourths of the whole population, and apply themselves to agriculture. These Indians are almost all Mexicans, and although very ignorant and superstitious, do not evince any perverse inclinations. Their manners and customs are somewhat loose; they are little inclined to work, but their natural docility leads me to believe that it would not be difficult to make them industrious and useful. They have not the disagreeable appearance of the Mijes and Soques, and if they are not to be compared to the Zapotecos, the difference is chiefly owing to the excessive use of strong spirits, as well as the habit acquired from childhood of

eating earth, which deforms them, and imparts to their complexion a sickly hue.

Jaltipan is celebrated among the Indian villages of this territory for having been the birth-place of the enchanting Malinche (Doña Marina), who by her fidelity and sagacity materially assisted the victories of Cortes.

The women of this village are famed, and not undeservedly, as the handsomest throughout the district; but in common with the rest of their sex in the isthmus they cannot boast of very strict ideas of propriety. It is also said that the male population, instead of watching them with a jealous eye, carry their ideas of hospitality to a very peculiar length.

A singular circumstance, deserving the attention of the ethnologist, is the existence of a race of dumb people, of which there are numerous families in Jaltipan. However strange this may appear it is nevertheless certain, and the *Rancho de los mudos* (settlement of the dumb), established a few years since near the lower part of the island of Tacamichapa, owes its designation to the fact that the individuals are all dumb, who inhabit the three or four houses which form this settlement.

The *Mestizos* are a mixed race of Europeans and Indians. They are in general more rational and industrious than the latter; but, like them, indulge in intemperate habits, and are much more turbulent. The number of *Mestizos* exceeds that of the Europeans.

CLIMATE.

The climate of this part of the isthmus is damp, but its temperature being generally low, compared not only with the southern division of the isthmus but even with the other coasts of the Atlantic, it is by no means unhealthy,

as its position would lead one to suppose. The centigrade thermometer does not reach in these regions more than 30 degrees; the most prevalent diseases are intermittent fevers, but no instances have hitherto been known of the yellow fever, endemic in other countries.

About the year 1830 three expeditions of Europeans were sent to the Coatzacoalcos for the purpose of colonization. By a most unaccountable want of foresight the unfortunate colonists were abandoned from the moment of their arrival, and were left without provisions, without shelter against the inclemencies of the season, and without assistance of any kind. Although every thing seemed calculated to favour the development and progress of an epidemic, no disease of this kind appeared among them, for those who died perished more from misery and famine than from any other cause.

By means of considerable felling of timber and the cultivation of the ground the climate of this portion of the isthmus would no doubt be considerably improved, as it would remove the clouds of insects which at present render a residence here to a great degree uncomfortable.

NATURAL PRODUCTIONS.

MINERALS.

I am unable to assert any thing positively respecting the mineral formations of this district. Information purely traditional suppose the existence of rich mines of precious metals at the heads of the rivers Jaltepec, Usapanan, &c.

In a statistical account of Don José Maria Iglesias mention is made of two mineral veins in the neighbourhood of the village of Joteapa, which were denounced in

1597 as being of silver, but the exact nature of which in reality is not yet known. It is stated in the same work that the calcareous rocks found in several parts of this territory might furnish excellent building materials; that in the settlement of *los Quemados* there is beautiful alabaster, and near Jaltipan gypsum of excellent quality. Lastly, it is stated that in the villages of Sayultepec and Moloacan there are fountains of petroleum; in the last mentioned place and Almagres springs of sulphureous water, and in the village of Chinameca a fountain of mineral waters, without mentioning its qualities.

I have been fortunate enough to be the first to find in the Mexican Republic mines of coals of a superior quality, which I have already legally denounced, and the circumstance of their being situated in the neighbourhood of a great river would render the conveyance of their produce very easy.

I have seen no indication in the isthmus of the existence of this valuable fossil, but certain analogies of geological formation suggest in my opinion the probability of its being found in a particular spot between Tehuantepec and Oajaca. I did not wish to omit these observations, on account of the importance of the subject in connection with our main object.

VEGETABLE PRODUCTIONS.

All the plants which I have mentioned, speaking of the southern division of the isthmus, are also found in the northern, but with a profusion incomparably greater. The luxuriance and majestic appearance of the forests of the Coatzacoalcos are beyond all description, and as Don Tadeo Ortiz well observed, they exhibit "a truly monstrous vegetation, of which ocular inspection alone can give an adequate idea."

The first impression produced in the minds of those who visit them is the immense advantages which a prudent speculator might derive from the proper use of their rich produce.

"These forests," says Ortiz, "might furnish all the mahogany and other fine woods required in the United States and throughout Europe, at prices considerably less than those of other parts of America, where these woods are certainly neither so abundant nor of the gigantic size of three metres in width and from 15 to 20 in height."

Don José Maria Iglesias, speaking on the same subject, says, "they abound (the forests) with the finest and most precious woods, but especially mahogany and cedar, which, without hyperbole, might well supply the whole of Europe."

Finally, Don Pedro de Garay says in his memoir, "there are seen on every side dye woods and timber, which will in time acquire their true value, and will exceed without doubt the cost of any speculation."

In almost all the rivers, and especially in the Jaltepec and Uspanapan, the pine is found in the upper part of their course; then comes the majestic oak, and in the lower part the most precious woods. Among those used in construction, the cedar, the sapota, the oak, the yellow-wood, the ebony, the *javicue*, *macayo*, and above all the *paqui* (iron-wood), which from its extreme hardness is also called there *quiebra hacha* (break-axe).

Along the whole coast of the Atlantic the tree which produces the kind of pepper known by the name of myrtle (*myrtus pimenta*) is found; and according to the calculations of Señor Ortiz, this fruit might be gathered annually to an amount of 250,000 francs.

In various parts, but particularly in the neighbourhood

of Jaltipan, I have observed the *siphonia cahuca*, from which the caoutchouc, or India-rubber, is obtained. In other spots the cassia is also very common. Fruit trees are almost innumerable: the sapotas of various kinds, the lemon, the orange, and the wild chocolate tree being remarkable among them, as well as two kinds of vine. The vanilla, the indigo plant, and the sarsaparilla are also very plentiful.

In the neighbourhood of Mina-titlan I found two species of the sensitive plant, one of which is the common *mimosa pudica* so generally known, and the other grows on a bush upwards of two metres in height. It would be useless to add that the most beautiful flowers are everywhere to be found, and that a great quantity of gums, resins, and balsams form a part of the rich produce of this magnificent vegetation.

ANIMALS.

It will be easily conjectured that forests so extensive as those to which we have been alluding must be inhabited by a considerable number of animals. The quantity of wild animals which infest these territories is almost innumerable, particularly in the neighbourhood of the settlement of Teposapa, according to Señor Iglesias. The tapirs, the deer, the rabbits, &c., are still more abundant; but surpassing all in number, is the tribe of monkeys, that delight in a plentiful harvest from the constant profusion of fruit by which they are surrounded. Many of these belong to the species before named when speaking of the southern division of the isthmus, while others are peculiar to the woods of the Coatzacoalcos, among which are some nocturnal species, and the *stentor ursinus* that frequently breaks the silence of the forest with his shrill

and powerful cries, so loud indeed, that judging only by its power any one not seeing the insignificant little animal from which it emanates, would suppose it to be of considerable size.

Following the course of the Coatzacoalcos, its banks are peopled with the so-called pheasants, the wild turkeys, the pigeons, partridges, ducks, and many other fowl, the flesh of which furnishes wholesome and delicious food. On the right bank of this river, near the Torno del Tepache, there will be found on the map a spot called the Matadero (slaughter-house), a very appropriate name used to express the havoc which sportsmen occasionally make there with only a few minutes delay.

The multitude of parrots which inhabit this country is really astonishing. There are also a great number of toucans, especially as the inhabitants of the isthmus include among these without any distinction the ramphastos and the pteroglossus. As regards other kinds of birds, their variety almost baffles calculation; some of them being remarkable for the beauty of their plumage, and others for the melody of their song.

The waters of this district abound in excellent fish. In the lower part of the Coatzacoalcos the manatus, called from its size the sea-cow, is frequently found. A peculiar kind of fresh-water tortoise deposit on the banks of these rivers great quantities of eggs quite different from those of the sea-tortoise, and very similar to those of the hen both in appearance and flavour.

The coasts of the Atlantic belonging to the isthmus are celebrated for the abundance of tortoise-shell they contain, the fishery of which gives employment to the industry of the inhabitants of Campeachy.

The guanas, the flesh of which is a delicious morsel to the natives of the isthmus, differ in the southern and northern

divisions. In the former they inhabit the dry and barren spots, and are of a dusky-brown colour, whilst those of the Coatzacoalcos are of a light-green, variegated in the males with beautiful red spots.

This district in common with the southern is unfortunately not free from the venomous reptiles which only disappear in the thickly populated regions. The credulity of the natives ascribe to many plants the merit of neutralizing the dangerous effect of the bite of the most poisonous of serpents, but the great number of these remedies causes me to doubt their efficacy. The only plan adopted, which appears to me effective if applied in time, is to extract from the wound by means of suction the venom and a part of the poisoned blood, an operation which is performed by many of the Indians, who on this account are called suckers.

In the oak thickets of this district there are vast quantities of bags of wild silk, and everywhere wax and honey in abundance.

INDUSTRY.

The picture of the state of native industry presented in this part of the isthmus is even more sad and discouraging than it was in the southern division. Agriculture, however, which in 1831 might be considered almost nugatory, has made some progress of late years, and several of the inhabitants have applied themselves to the cultivation of cotton and tobacco, although I am unacquainted with the respective amount of these products.

The cotton grown here appears to be of excellent quality, and also the tobacco, which is especially cultivated in the territory of Jaltipan, where the natives understand well its management. The grains more generally sown

are maize, beans, and rice, but only in sufficient quantity for home consumption.

The soil is so fruitful that both Don Tadeo Ortiz and Don José Maria Iglesias assert, that the efforts of the cultivator are in some places rewarded with five annual crops of maize; each of these crops is distinguished by a different name, being respectively called tornamil, tepachole, temporal, tepeta, and etopil. Señor Ortiz, speaking with enthusiasm of this fertility, says: "that which most particularly characterizes this privileged region, however, is the singular fact that one single sowing of rice, will yield successively two large crops without the slightest additional labour, as I had an opportunity of observing in the rancho de Gavilanes situated in the strand between the rivers Coatzacoalcos and Toneladas."

The sugar-cane, coffee, and cocoa prosper throughout this district, and are cultivated in the neighbourhood of almost all the settlements, although in very limited quantities. On the Coatzacoalcos, the only plantation of any importance is one of coffee and cocoa, which an European settler established a few years ago, near Hidalgo-titlan on the banks of this river, opposite to this village.

The iztle is chiefly cultivated at Jaltipan, Soconusco, Tejistepec, Oteapa, Ishuatlan, and Moloacan. In 1831, Señor Iglesias numbered 1221 iztle plantations, the produce of which, generally sent to Vera Cruz, he estimated at upwards of 100,000 francs.

In Mina-titlan there is a brandy distillery, the most considerable in the district, but almost everywhere, and even in the ranchos or small settlements, this pernicious liquor is distilled by means of an alembic of baked earth, the rude instrument of primeval industry.

As regards mechanical arts, it may be said that none whatever exist in this district. In the statistical accounts

of 1831, the only statement I find upon the subject is, that the natives of Jaltipan occasionally tan a few hides which they use for the manufacture of saddles.

OBSERVATION.

It may be well to observe here that the population and resources of the isthmus are more considerable than would appear from the foregoing statement.

The whole of the resources and population of the district of Tehuantepec ought to have been included in the southern division. I have, however, only referred to that portion included within the topographical limits of the isthmus.

With regard to the district of Acayucam, I have already said that its agriculture has received a remarkable impulse since 1831, but I have omitted to make mention of the quantity of cattle belonging to its towns, estates, or ranchos, whenever my assertions could not have rested upon positive information. It is therefore evident that the resources of the isthmus of Tehuantepec are underrated in the preceding statistical notice*.

* See Appendix C.

ADVANTAGES OF AN OCEANIC COMMUNICATION

THROUGH THE

AMERICAN ISTHMUS,

AND PREFERENCE WHICH OUGHT TO BE GIVEN TO THE TERRITORY

OF TEHUANTEPEC

OVER THOSE OF PANAMA AND NICARAGUA.

CHRISTOPHER COLUMBUS was the first to estimate the great importance to the whole world of a maritime communication across the American isthmus. The advantages that would result from it are indeed so evident, and the lucid observations of Humboldt, which prove its importance, are so well known and appreciated, that it appears to me needless to repeat them in this place; I will therefore only add one other remark which I have not hitherto met with, but which will give them a more extensive application.

It is generally acknowledged that if the communication be once effected, all the vessels, which from their ultimate destination are now compelled to double Cape Horn, would, of course, pursue their route through the isthmus. It is also admitted, that in consequence of the favourable winds and currents this voyage would be preferred to that round the Cape of Good Hope, even for vessels

proceeding from Europe to China and Japan ; but it is believed that it would be by no means equally convenient for their return from China to Europe, still less for the voyages to and from the East Indies.

If, in order to solve this problem, we were to consider only the positive distance that separates the extreme points of these navigations, nothing certainly would be gained in the latter case by following the course through the isthmus in preference to that at present adopted round the Cape of Good Hope ; but if, on the one hand, we take into consideration the difficulties and dangers to be encountered in this navigation, and on the other the advantages which might be derived from making port half way, in a country undoubtedly destined by its natural wealth to the highest future prosperity, as well as the additional and incalculable advantage of being enabled to estimate beforehand the probable length of the voyage, it cannot be doubted for an instant that the course through the isthmus ought at all times to be preferred. This opinion, which may now appear doubtful, will certainly cease to be so on that day, probably not far distant, when the progress of mechanical science will enable the mariner to disregard altogether the uncertainty of the wind, and when that route will be deemed the best which offers the safest navigation.

The American isthmus extends from the Darien Gulf, where it is united to South America, as far as Tehuantepec, where North America may be said to commence. Different parts of this isthmus have appeared to offer advantages in their topographical form, and have invited attention to their fitness for the desired communication. It was however soon observed that only three of these localities were worthy of consideration ; namely, those which from the principal towns in their territory are designated by

way of distinction, isthmus of Panama, of Nicaragua, and of Tehuantepec.

In respect to the first of these named places the distance between the two oceans is only 65 kilometres. It is impossible therefore to examine the map of the American isthmus without being inclined to consider this point as the most eligible. The distance that divides the two seas is greater at Nicaragua, namely 150 kilometres, but being intersected by a lake of vast dimensions, this point would also appear to offer considerable advantages. Lastly, the territory of Tehuantepec, forming a continued line of 220 kilometres, is that which upon a superficial examination presents the greatest obstacles for the accomplishment of the object contemplated.

However, notwithstanding these appearances, as a greater or less distance is not the only circumstance to be considered, it precisely happens in the three above-mentioned instances that the practicability of the work is in an inverse ratio to the shortness of the distance; and thus, whilst in the present state of our knowledge its execution is apparently impossible at Panama, and attended with immense difficulties at Nicaragua, we find it practicable and easy at Tehuantepec.

The isthmus of Panama has been from the time of the conquest the object of the most diligent investigations, and it is an error to suppose that the Spanish Government never paid any attention to this subject. Unfortunately not one of the explorations which were practised offered any satisfactory result, and the silence relative to this subject, which was maintained by the celebrated astronomers who at the close of the last century resided for some time in these regions, is the greatest proof that they had no favourable tidings to communicate to the world upon this important matter.

The form and topographical aspect of a country so limited in extent, and which had attracted a considerable share of public attention, could not possibly have remained unknown during three centuries, whilst it is very evident that there are not in either of the two opposite coasts any natural harbours to which the extremities of a canal could be directed. It has been lately asserted that all difficulties had disappeared, and that it would be as easy to construct a canal in Panama as it would be in Holland. The more recent report, however, of intelligent engineers purposely sent thither to ascertain the facts seems on the contrary to point out the great obstacles which the territory presents to an enterprise of this nature; but even supposing that the topographical aspect of the ground offered no difficulty whatever, there are others quite sufficient to render it impracticable, and which unfortunately cannot be remedied.

Monsieur Michel Chevalier, while examining the circumstances which ought to be kept in view in selecting the most appropriate place for an oceanic communication, very justly observes that one of the most important is its salubrity. He says :

“ However great might be the saving of time effected “ by steering through the isthmus, it would always be “ shunned by vessels if it were to prove a charnel-house.”

The climate of the isthmus of Panama is acknowledged to be dangerous, a fact confirmed by the accounts of Humboldt and other writers. The fear of its unhealthiness was one of the causes that prevented the assembling of Congress there, after the emancipation of the states of Spanish America had been convened, in order to establish a system of general policy suited to the interests of the American nations. The same fear prevented the engineers,

Lloyd and Falmarc, remaining in the isthmus a sufficient time to complete the labours of the exploration, which they undertook in 1827 and 1828 by order of General Bolivar, and in a succeeding expedition Lloyd lost his life. To this grievous cause is likewise to be ascribed the paucity of population and the want of the necessary means of existence in that isthmus, and as the climate does not permit the increase of the former there is no possibility of augmenting the latter.

The isthmus of Panama is again being explored, but it has been lately estimated that even should the work be at all practicable its accomplishment would require the united efforts of the principal nations of the world and an expenditure of at least 200 millions of francs.

The isthmus of Nicaragua possesses a fertile territory, a healthy climate, and is not deficient in population. Towards the north the lake of Nicaragua communicates with the Atlantic by means of the mighty river St. John, and in the south only a small distance separates this lake from the coast of the Pacific. Thus the isthmus of Nicaragua seems to offer many advantages; but upon a more minute examination there appear many difficulties, and these of an almost insurmountable nature.

From the report published by command of the government of the state of Nicaragua in reference to the exploration of that isthmus, effected during the years 1837 and 1838 by Mr. J. Bailey, it seems that the course of the river St. John with all its windings is about 150 kilometres in length, six and a half of which are obstructed by four rapids, caused by banks of rock stretching across the whole width of the river. These obstacles and the long course of the river were considered such formidable impediments as to suggest the construction of a canal as

an easier operation than that of rendering the river itself navigable.

Towards the south, a distance of nearly 28 kilometres between the lake and the Pacific, the territory is occupied by a chain of mountains which, although not very elevated, would occasion works of extraordinary magnitude. It would be necessary to excavate a considerable portion of it to a depth much greater than has been hitherto customary in works of this kind, and throughout more than five kilometres it would be indispensable to bore the mountains, and open a tunnel of sufficient dimensions to admit the large vessels employed in transatlantic navigation. The possibility of attaining such an object is not a little doubtful, especially if the nucleus of the chain to be bored through consists, as well as the Andes of which it forms a part, of granite or ancient porphyry, as there is every reason to believe notwithstanding the superficial experiments made by Bailey.

The port of St. John south, which would be sought to be reached on this side, is not adequate from its small dimensions to the required object, and moreover it appears that with the prevailing north and north-east winds its access is not only difficult but even dangerous.

It has been calculated that this undertaking would cost 150 millions of francs; but even this sum is probably much smaller than that which would be required.

The greater part of the distance which separates the two seas in the isthmus of Tehuantepec is occupied on the south by the lagoons and extensive plains, and on the north by the course of the Coatzacoalcos, so that the principal works to be executed would be comprised between latitude $16^{\circ} 36''$ and $17^{\circ} 3''$ north, including a space less than 50 kilometres in extent, wherein no excavation whatever exceeding the usual limits would be required.

As the object of our undertaking is a division canal, it was essential to convey to the point of division a requisite quantity of waters. Those of the river Chicapa and its confluent husbanded with care would alone have sufficed, but desirous of being prepared for the contingency of an extraordinary drought we have sought out the means of obtaining an increase, and have so far succeeded in our object as not only to acquire the necessary body of water to feed the canal, but even a surplus quantity, which may be employed in increasing the currents of the rivers which it may be considered advisable to render navigable.

Our canal might have an excellent port at each of its extremities, and the materials for construction cannot be more abundant, superior in quality, or better distributed. A climate remarkable for its salubrity favours also the isthmus of Tehuantepec, and the departments of which it forms a part number a population of seven hundred and fifty thousand inhabitants.

The admirable fertility of the soil and the abundance of cattle and resources of all descriptions would enable the vessels to renew their provisions at easy prices at the isthmus, therefore they might devote a greater portion of their hold to the storing of merchandise.

Besides these purely local advantages, the isthmus of Tehuantepec offers over those of Nicaragua and Panama others of a more general nature for navigation, affording to vessels proceeding from Europe or the United States, which from their destination have not to descend to more meridional latitudes, a communication more direct and through a more genial climate. On their return, vessels navigating the Pacific are now obliged to seek a northern latitude in order to escape the influence of the trade-winds, and for these also the course through the isthmus

of Tehuantepec would be much less circuitous. Lastly, the fresh but not dangerous north and north-easterly winds are common to the whole of the American isthmus, but Tehuantepec is not subject to the protracted calms which at some seasons of the year paralyse navigation at Panama.

CONCLUSION.

I MAY perhaps be allowed, in concluding this Report, to express my ardent wishes that our labours in the isthmus may not be considered in reference only to whatever scientific merit they may possess, but as the means by which a most important fact has been ascertained, and which I have described in the preceding pages with the strictest conscientiousness. Should it be so, I am not without hopes that the great work which has been during three centuries so anxiously desired, and which the present commercial and political state of the world loudly demands, will at length be undertaken.

Many circumstances concur at the present moment highly conducive to its execution, and which ought to be made available.

The zealous interest which the Mexican Government have taken in the matter is clearly demonstrated by the liberal concession made to the projector, and by the promptness with which all his applications have been favourably answered, as may be seen by comparing their dates with those of the corresponding decrees inserted in the following Appendix.

The Government of Mexico had undertaken to afford every protection and assistance in their power to the enterprise of Don José de Garay, and all the orders issued with this view were punctually fulfilled. The Commission owe their most sincere acknowledgments to the local

authorities of the isthmus, and now offer them through my medium. All the public officers vied with each other in affording every possible assistance to the Commission, forwarding their object by means of circulars and orders to the inferior authorities, and readily furnishing all the information and particulars concerning their object which might be useful and interesting.

The inhabitants of that territory evinced the greatest desire for the realization of this great undertaking, and the Commissioners were never compelled to make use of the armed force which had been placed at their disposal. This favourable disposition was never so apparent as during the act by which Don José de Garay was legally put in possession by order of the government of the territories granted to him, since besides its having been effected with the greatest order, the proprietors of the adjacent lands who were present declared before the civil and judicial authorities, that they had no objections whatever to offer to the concessions, as they did not at all affect their property.

I cannot conclude these observations in a manner more pleasing to myself than by offering a public homage of my esteem to the gentlemen who accompanied me in these toilsome labours, which they so materially assisted.

In the short period of time during which Mr. De La Trouplinière took a part in the proceedings of the Commission, he assisted with great zeal and attention.

In mentioning the name of Captain Gonzalez, the remembrance of his kind and gentle disposition, his indefatigable industry, and his talents and information, renders his early loss more lamentable. His delicate constitution gave him a presentiment of the shortness of his life. Towards the close of our labours in the isthmus his ailments had gradually increased, and four months after our

return to Mexico he expired, leaving in the minds of his companions, who by my hand spread these few flowers over his grave, a lively remembrance of the feelings of sincere friendship with which he had inspired them.

Captain Robles, a gentleman of uncommon talent and information, has been the most active and intelligent colaborator of the Commission in all kinds of operations, and gives great hopes to his country.

Señor Don Pedro de Garay, entrusted both with the secretaryship and with the administration of the expedition, acting in accordance with the instructions of the projector, provided with great taste and liberality for the comforts of the Commissioners, as well as of their numerous retinue; besides which the statistical section shows how much is due to his diligent investigations.

Lieutenant Guido lent also his willing assistance to the Commission; and in one word, every one of the members composing it vied with each other in zeal for the fulfilment of their respective duties.

London, June 1, 1844.

GAETANO MORO.

APPENDIX.

A.

ASTRONOMICAL OBSERVATIONS.

TABLE No. 1.

Latitudes determined from astronomical observations.

Cupola of the church of Juchitan	16° 26' 10"
Church of San Mateo Huazontlan del mar..... ..	16 12 47
Id. San Dionisio Tepehuazontlan	16 16 30
Id. San Juan Guichicovi	16 58 35
Id. Santa Maria Chimalapa	16 55 5
Paso de la Puerta	17 12 35
The strand on the right bank of the Coatzacoalcos below the mouth of the river de la Puerta (or Jumuapa)	17 21 5
South point of the island of Pedernal	17 27 45
Horqueta of the island of Tacamichapa	17 43 „
Hidalgo-titlan	17 46 36
Mina-titlan.....	17 58 55

TABLE No. 2.

Geographical positions of the principal points of the Triangulation.

The longitudes are reckoned from the meridian of Juchitan, which is 95° 9' 37",5 west of Greenwich.

	North Latitudes.	West Longitudes.
Cerro del Morro	16° 10' 24"	7' 57"
Xunirahui	16 12 40	13 10
Daniguibixo	16 14 36	7 16,5
Town of Huilotepec.....	16 14 54	7 42
Daniliesa (Cerro de la Cueva)	16 20 7	13 16
Daniguibedchi (Cerro del Tigre)	16 20 10	11 55
Parish church of Tehuantepec	16 20 16	12 24

	North Latitudes.	West Longitudes.
Danigú or Camotepec.....	16° 22' 6"	3' 44"
Church of Espinal	16 29 26	1 18
Id. of Itzaltepec	16 30 27	1 57
Daniguiati	16 31 59,5	3 50
Cerro de Laollaga	16 32 32	12 51,5
Church of San Gerónimo	16 34 20	4 29
Id. de Chihuitan	16 35 44,5	8 16
Guévichí	16 37 26	5 30
East summit of Huacamaya	16 42 28	1 15,5
Guévixia	16 43 8	5 15
Pico del Almoloya	16 44 8	3 48
Church of Barrio	16 48 40	5 18
Id. Petapa	16 49 36	5 48
Id. Santo Domingo	16 49 45	7 5
		East Longitudes.
Church of San Mateo Huazontlan del mar	16 12 52,5	2' 31"
Hunchilaif.....	16 13 32	23 49
Church of Santa Maria del Mar.....	16 13 33	9 56,5
Summit of Baxmumbah	16 14 42	22 27
Id. Malumbiamlaif	16 14 59	24 31
Island of Tilema	16 15 30	7 33
Summit of Umalalang	16 16 39	11 13,5
Id. of Mitichuaxtoco (cerro de Santa Teresa)	16 17 10	13 22
Island of Monapostiac	16 20 34	7 13
Mitiacix or Cerro de la Iguana (island)	16 23 9	9 28
Tiactinayix	16 26 12	13 40
Cerro del Zopilote	16 26 31	31 36
Hacienda (estate) of the Venta de Chicapa	16 34 "	12 14
Cerro del Lagartero.....	16 34 15,5	6 25
Summit of the Pié de Banco.....	16 34 41	20 29,5
Pico de Rinconchapa	16 37 13	11 14
Cerro de Paloblanco	16 38 17,5	13 51
Id. of Zapata	16 39 5	15 3
Summit of Piedra Parada.....	16 39 8	9 34
East peak of Cerro Prieto	16 39 41	2 3

	North Latitudes.	East Longitudes.
The bare hill to S. S. E. of San Miguel Chimalapa	16° 42' 11"	16° 14"
Summit of Paso Partida	16 42 17	11 28
Church of San Miguel Chimalapa	16 43 „	16 33
Cerro del Convento	16 43 11	12 15
Peak of the Cerro Atravesado	16 43 12	30 8
Hacienda of Tarifa	16 43 31	8 57
Cerro de Albricias	16 44 21	15 49
Summit of Chichihua	16 44 34	12 57

TABLE No. 3.

Altitudes resulting from trigonometrical measurements.

	Heights above the level of the sea.
Summit of Daniguiati	metres 274, 5
Top of the cupola of the church of Juchitan	35, 8
Basement of the same church	18
Monapostiac	111
Umalalang	218
Daniguibixo	298
Guiévichí	416
East peak of Cerro Prieto	460
Guiévixia	508
Masahua (the middle summit)	687
East summit of Huacamaya	775
Cerro de Laollaga	1243
Palo Blanco	371 ,
Estate of Tarifa (the place of the habitations)	208, 5
Cerro de Piedra Parada	416
Id. del Convento	446
Paso Partida	466
Masahuita	615
East summit of Masahua.....	696
Guiéxila	1152
Peak of the Cerro Atravesado.....	1529
The highest peak beyond it	2343

TABLE No. 4.

BAROMETRICAL ALTITUDES

Across the Isthmus of Tehuantepec.

	Heights above the level of the sea.
Umalalang.....	metres 220
Mitiachuaxtoco	250
Daniguibixco	296
Venta de Chicapa (house at the estate)	24
The river Chicapa, near the Rancho of la Puerta Vieja.	83
The river Coatzacoalcos at the confluence of the Chimalapilla	119
Source of the stream Monetza	196
Petapa (the town-house).....	204
The river Chicapa at the Ultimo Rancho.....	208
Farm of Chivela	210
Source of the river Almoloya	225
Santo Domingo (the town-house)	226
El Barrio (idem).....	232

Road from Santa Maria to San Miguel Chimalapa.

San Miguel Chimalapa (the town-house)	119
Rancho de la Cofradia	376
The stream running towards Chichihua and often traversed	275
Jacál del Ocotal.....	331
Pass of the river of Chichihua	189
Pass of the river Escolapa	150
Jacal del Chocolate	326
Pass of the rivers del Milagro	84
Santa Maria Chimalapa (the town-house)	262
La Piedra del Viejo (the highest point between Santa Maria and the river)	296
The river del Corte at the confluence with the Chimalapilla	119
Tehuantepec	42
Zanatepec	50
San Gabriel Boca de Monte	50
San Juan Guichicovi (the town-house)	240

TABLE No. 5.

*Heights above the level of the sea of various places on the road
from Tehuantepec to Puebla.*

Tequisistlan.....	metres	210
Rancho de las Vacas.....		745
San Bartolo Yautepec		870
Rancho Quemado		1160
San Pedro Totolapan (the lowest part of the town)		940
City of Oajaca		1535
San Juan del Estado.....		1080
Venta de Aragon		1005
Cuicatlan		420
City of Tehuacan		1575
Tlacotepec		1905
Tepeaca		2210

B.

GEOLOGY.

Catalogue of the Geological Collection formed in the Isthmus of Tehuantepec by the scientific Commission entrusted with the exploration of the Isthmus, and classified by Señor Don Andres del Rio.

SIERRA MADRE (PRINCIPAL CHAIN) AND NEIGHBOURING HILLS.

NON-STRATIFIED ROCKS.

1. Milk quartz with a resino-vitrous lustre, and with the clivage of the rhomboedron very distinct, found near Chivela.
2. Decomposed granite near the Hacienda de Tarifa.
3. Granite found in the descent from the Portillo de Tarifa to the plain of the Venta de Chicapa.
4. Granite in pebbles in the upper course of the Coatzacoalcos.
5. Syenite also in pebbles in the same spot.
6. Syenite at the foot of the Sierra, at little less than midway from Niltpec to Zanatepec.
7. Dioritic porphyry, or porphyritic greenstone, in the descent from Guichilona to Chihuitan.
8. Hypersthene rock found in the heights which surround the source of the stream Zopiluapa, cutting at intervals the calcareous rock.
9. Antique porphyry with crystals of felspar, tinted with chlorite and ferruginous clay from the hillock of Guichicovi.
10. Claystone porphyry from the summit of Cerro Atravesado.
11. Magnetic iron ore from the hills of Niltpec.

STRATIFIED ROCKS.

12. Quartz rock found in the descent from the Portillo of Tarifa to the Rancho de la Agua Escondida.

13. Quartz of a chipped texture from the Paso del Ostuta, on the road to Zanatepec.
14. Quartz breccia, resting on the porphyry in the summit of the Cerro Atravesado.
15. Greenstone schist, hornblende rock of Lyell, peak of Gué-vixia.
16. Grey-wacke schist; descent from Guichilona to Chihuitan.
17. Grey-wacke from the hills of Barrio.
18. Clay-slate, with the appearance of pearl-stone resting on the quartz in the summit of the Cerro de Espinosa.
19. Clay-slate from the Portillo de Tarifa.
20. Clay-slate found in the descent from the Portillo to the plains of the Venta.
21. Clay-slate, also with the appearance of pearl-stone on the summit of Paso Partida.
22. Clay-slate, in the gap between the above-named hill and that of Convento, on the road from Tarifa to San Miguel Chimalapa.
23. Clay-slate on a hill on the road from Tarifa to the Cienaguilla.
24. Greenstone schist found in the summit of Palo Blanco, mixed with fragments of quartz.
25. Greenstone schist in the pass of the Chicapa, near the Rancho of Puerta Vieja, on the road from the Venta to San Miguel.
26. Greenstone schist from the heights of the Upper Chicapa.
27. Greenstone schist changing to dioritic from the ascent to San Miguel Chimalapa.
28. Grey-wacke schist from the hills between the river Malatengo and the ancient estate of Xochisapa, on the road to Boca de Monte.
29. Talcose schist from the brow of the Sierra, in the ascent from Niltpec to the Cerro Atravesado.
30. Clay-slate from the foot of the Sierra, half-way between Niltpec and Zanatepec.
31. *a* and *b* clay-slate and talcose schist from the banks of the Upper Ostuta.
32. Dolomite limestone found in a hillock at the foot of the hills of Laollaga.
33. Compact limestone, with veins of calcareous spar, found near the slate in the neighbourhood of the Rancho del Zapotal.

34. Compact limestone which breaks into thin sheets in the descent from the Portillo to the plains of the Venta.
35. Calc tuff? from the same spot.
36. Compact limestone, and occasionally stinkstone, with veins of pearl-spar, from the Convento Chico.
37. Compact limestone of the Convento Grande: in one of the pieces there is a vein of calcareous spar, with fragments of diorite.
38. Quartzose sandstone from Daniguiati.
39. Argillaceous sandstone from Guievichi.
40. Sandstone, partly quartzose and partly argillaceous, near the estate of Chivela.
41. Sandstone schist from the table-land of Tarifa.
42. Sandstone from the foot of the small hill of Guibicis.
43. Sandstone from the Piedra Parada of Daningadchi.
44. Argillaceous sandstone from the foot of the Sierra, halfway between Niltpec and Zanatepec.
45. Claystone which may change to jasper, on the road to Santa Maria Chimalapa, between the river Escolapa and the Chocolate.
46. Jasper found in pebbles in a strand of the Upper Coatza-coalcos.
47. Argillaceous stone in layers, little inclined, resting on the porphyry, No. 9.
48. Guigosiña stone.
49. Calcareous stone with a circular design, found on the brow of the hills of Masahua, in the source of the stream Tolisteco.
50. Calcareous stone with cavities, resting upon another similar to that on the Cerro del Convento.
51. Variegated marls resting upon sandstone, on a hillock near the Hacienda de la Chivela.
52. Earthy marls, taken from a cavity in the calcareous rock in the ascent to the Portillo de la Chivela.
53. Common marl lying over the sandstone, No 38.
54. Calcareous breccia, on the road from the Venta to San Miguel.
55. Pearlstone breccia, found in loose fragments in the stream followed in going from Zanatepec to the Upper Ostuta.
56. Lamellar specular iron ore, from the neighbourhood of Tarifa.

BANKS OF THE RIVER COATZACOALCOS.

57. Sandstone with a base of ferruginous clay, from above the confluence of the river Chimalapilla.
58. Greenstone rock, from a rapid a little before Angostura.
59. Metamorphic, or primary limestone, from the bank of the river a little below the mouth of the Malatengo.
60. Decomposed granite, from the great rapid below the old landing place of Mal Paso.
61. Clay from the small hills on the banks of the river in its lower course: *a* from the hill of Oajaqueña; *b* from that of Churiagao; *c* from that of Peñas Blancas.
62. Clay in layers, alternating with others of sand at Juchitan, 12 metres below the alluvial soil which covers the plain.
63. Calc tuff, from the margin of the fountain of Agua Caliente.

HILLS NEAR THE LAGOONS AND ISLANDS IN THE UPPER LAGOON.

64. Grey-wacke, very finely grained, of the island of Iguana or Mitiacix.
65. Porphyry with basis of jasper, from the Mitiaxocueu.
66. Porphyry with basis of argillaceous stone, from the summit of the hillock of Potrero.
67. Trachitic porphyry with small veins of calcedony, from Danigu.
68. Conglomerate of argillaceous base, from the small ravine of Chico Zapote or Endedchina, near to Danigu.
69. Jasper, from the small heights near those of the Potrero.
70. Dioritic porphyry, of the Manguixtiac.
71. Porphyry from the summit of Umalalang.
72. Syenitic greenstone from the island of Monapostiac, in large separate pieces.
73. Stratified greenstone, from Natartiac or Cerro Prieto.
74. Fine grained granite in veins from the same hill, intersecting the former rock.
75. Greenstone from the same, resembling basalt, and taken from near the veins.
76. Greenstone with veins of tremolite, from the hill of Santa Teresa or Hnaxtoco.

77. *a* Graenstone from tha hill near to the Hacienda de Santa Teresa, intersected by veins of the granite *b*.
78. Conglomerata of fragments of greenstone from tha brow of the Umalalang.
79. Argillaceous conglomerate, from the foot of tha southern slope of the Maloxuet.
80. Prase, found under tha slate in the sama hill.
81. Grey-wacke, from the small hill of Umalpotate at the foot of the former.

SIERRA DEL MORRO, AND HILLS NEAR TEHUANTEPEC,
HUILOTEPEC, AND SAN FRANCISCO.

82. *a*, Ancient porphyry, with veins *b* of red iron and hidrate of iron, from the Cerro de la Cueva.
83. *a* and *b*, Tha same porphyry also, with veins from the Cerro del Morro.
84. Dioritic porphyry, intersected by veins of sienite *b*, from the Cerro dal Tigre or Daniguibedchi.
85. Finaly-grained sienite, from the hills of San Diego.
86. Sienite and another rock, composed of quartz and albite, from the Huilotepec or Daniguibixo.
87. Graphie granite of the hills of Huazontlan.
88. Veins of porphyry, altered by the fire of the hills of the Morro.
89. *a*, Dioritic porphyry of the Baxmumbah; *b*, granite from a fragment which intersects and partly covers the dioritic porphyry; *c*, new granite in veins which intersect the two previons rocks.
90. Granite and sienite from the Malnagirastiac.

C.

STATISTICS.

TABLE No. 1.

Notice of the towns and villages in the southern division of the isthmus of Tehuantepec, with their respective census, from the account furnished to Don Pedro de Garay by the Prefect of that district.

Names of the towns and villages.	Census.
Tehuantepec—town.....	8934
1. Santa Catalina Mistequilla	247
2. Tlacotepec.....	282
3. Santiago Laollaga	152
4. Santo Domingo Chihuitan.....	532
5. San Gerónimo	805
6. Itzaltepec.	1546
7. Espinal	504
8. Juchitan	4567
9. Huilotepec.....	185
10. San Mateo del mar	1500
11. Santa Maria del mar	148
12. San Dionisio del mar	888
13. San Francisco del mar ...	287
14. Zanatapec	336
15. Niltepec.....	626
16. Tapanatepec	321
17. San Miguel Chimalapa	318
18. Santa Maria Chimalapa.....	524
19. Santa Maria Petapa.....	1447
20. Santo Domingo Petapa	626
21. Barrio de la Soledad	909
22. San Juan Guichicovi	5000
23. San Gabriel Boca de Monte	71
	<hr/>
	30845

Note.—In the census of the above places, the number of inhabitants of the haciendas (estates) and ranchos (settlements) of their respective jurisdictions (table No. 2) has been included.

TABLE No. 2.

Notice of the principal haciendas and ranchos of the southern division of the isthmus of Tehuantepec, and of the number of horn cattle in each, calculated from the most authentic information which Don Pedro de Garay was able to obtain.

Names of the haciendas and ranchos.	Number of head of horn cattle.
Llano	—
Mal Paso	250
San Nicolas	1000
Zuleta.....	300
Jicaras	1000
Salazar	125
Nisabiti	300
Cienaga	60
Guigochuni	50
Rio Grande ..	800
Trapiche de Santa Cruz	—
Nanches.....	150
Potrero de Santo Domingo	1100
Barrio de Petapa.....	2000
Guichilona ..	200
Chicapa.....	} Marquesanas
Tarifa	
Chivela	
Trapiche de San Pablo	—
Espinal	3000
Mesquital	200
Los Cerrillos	400
Paso Lagarto	700
Huasuntlan ..	80
Frailscas	1480
Santa Bárbara	100
Lachilana	100
Comitancillo	120
Juchitan	12820
San Francisco del mar	8000
	<hr/>
	44135

TABLE No. 3.

Notice of the towns and villages of the northern division of the isthmus of Tehuantepec, their respective census and the number of head of cattle in each, according to the data furnished by the statistics of the state of Vera Cruz, published in 1831.

Names of the towns and villages.	Inhabitants.	Oxen.	Horses.	Mules.
San MartinAcayucam (villa)	1902	267	249	50
1. San Andres Sayultepeque	1206	—	—	—
2. Tejistepeque	2132	—	88	—
3. San Juan Oluta	659	—	—	—
4. Santa Ana Soconusco	1611	—	46	—
5. Jaltipan	1302	88	238	—
6. Cosoliacaque	1595	303	52	—
7. San Pedro Joteapa	1665	16	40	—
8. Santiago Mecayapa	736	—	55	—
9. Santa Maria Minsapam ...	773	—	—	—
10. San Juan Chinameca	779	3679	906	45
11. Oteapam.....	857	147	33	—
12. San Cristobal Ishuatlan ...	497	500	21	—
13. Santiago Molocan	624	—	—	—
14. Minatitlan and neighbour- ing ranchos	400	?	?	?
15. Hidalgotitlan & its ranchos	300	?	?	?
	17038	5000	1728	95

TABLE No. 4.

Notice of the haciendas and rancherías in the northern division of the isthmus of Tehuantepec, with their census and number of head of cattle respectively, from the data furnished by the statistical account of the state of Vera Cruz, published in 1831.

Names.	Inhabitants.	Oxen.	Horses.	Mules.
Ranchería de Michapa.....	325	230	160	—
Idem del Encinal.....	382	—	35	—
Rancherías { Coyote Guellapam Jalapa Cosaguilapa Lechonal }	450	—	—	—
Hacienda del Pedregal.....	20	100	—	—
Idem del Calabozo	63	—	—	—
Id. de Santa Catalina.....	210	1000	10	2
Id. de San Juan B. Nopalapam	435	30000	4000	180
Id. de Cuatotlapam	716	19000	4000	285
Ranchería de la Malota	287	—	—	—
Id. de Corral Viejo.....	81	—	—	—
Id. del Paso de San Juan	264	—	—	—
Hacienda de Solcuautila	123	5000	—	—
Id. de Santa Catalina de los Ortiz	133	1300	360	18
Id. de San Felipe.....	254	—	—	—
Ranchería de los Quemados ...	254	—	—	—
Rancherías { Camahuacapa Correa Casas Viejas }	165	513	73	—
Hacienda de los Almagres	49	2200	200	8
Idem de San Antonio	9	400	90	4
Id. de San José Teposapa	7	2400	10	2
	3973	62143	8938	499

TABLE No. 5.

Summary of the statistical notices respecting the number of inhabitants and head of cattle in the isthmus of Tehuantepec.

Divisions.	POPULATION.	CATTLE.		
	Inhabitants.	Oxen.	Horses and mules.	Sheep.
Southern part of the isthmus	30,845	44,135	11,260	1500
Northern part	21,011	67,143	25,000	230
Total..... ..	51,856	111,278	36,260	1730

Note.—In all the proper names of places mentioned in the preceding Report, whenever the letter *x* occurs it ought to be pronounced as the French *ch*, or the English *sh*, this sound having been expressed by *en x* in all the Mexican dictionaries from the period of the conquest.

D.

DOCUMENTS.

Nº 1.

Memorial of Don José de Garay, soliciting of his Excellency the President of the Mexican Republic the privilege of opening a communication between the Atlantic and Pacific Oceans through the isthmus of Tehuantepec; and Edict granting the same.

SIR,

Your Excellency has caused the Mexican public to look forward to the present epoch as one of improvement and gigantic advancement in the career of national aggrandisement.

No measure can be more fruitful in prosperous results, none more memorable or more glorious, than that which shall form a junction between the two oceans without the necessity of doubling that stormy cape which forms the southernmost extremity of the American continent.

Thousands of ships yearly perform this difficult and tedious voyage, passing twice through the tropics in the midst of innumerable and imminent dangers.

The mind is bewildered with the difficulty of embracing in one comprehensive view the astonishing consequences that would result from a communication between the two oceans, by means of which ships sailing from Europe will save two thousand leagues, and those from North America three thousand one hundred leagues, in their voyage to the coasts of China. What an economy of time

and money! And how far will these advantages extend now that the lines of steam-boats established upon the high seas have so prodigiously shortened distances!

A great revolution will take place in the commercial and even in the political affairs of all nations the instant America shall open the passage through any of her isthmuses. The epoch which shall see this effected will be more memorable than that of the discovery of this continent, and the name of him to whom the world shall owe this event will be at least as glorious as that of Columbus.

If your Excellency is ambitious of this glory for yourself and your country, you should now dedicate your attention and the powerful mind with which you are endowed to the execution of the enterprise contained in the present representation, and to which is annexed the project I have conceived for forming a communication between the two oceans.

By this your Excellency will see that I propose to execute this grand work in a very short time, considering the magnitude of the enterprise; that I ask not the least pecuniary assistance from the government; and that from the commencement I offer to the national treasury a considerable revenue: *viz.* one-fourth of the net profits which may arise from the dues and imposts to be collected on the line of the route, and which dues and imposts will, after the term of fifty years, belong wholly to the republic.

What I ask as an indemnification of expenses is certainly not much, when it is recollected that it will be necessary to form ports, raise fortifications and various other edifices, and open roads and canals; and when it is borne in mind that the indemnification does not consist in any valuable property of which the government is at present possessed, but in property to which I must create a value.

Should the lands, of which I solicit a grant, come to have a value hereafter, my exertions will have caused this effect, for at the present day they have none whatever.

The enterprise could not be undertaken for less than what I have solicited, because the magnitude of the works will be such as probably to absorb the resources arising from what I ask.

Your Excellency cannot fail to remark two very striking features in my project. First, the establishment of the lands to be conceded for the enterprise into a neutral territory; this is a point worthy of the magnanimity of government, and necessary to in-

terest all nations, in order that the communication may not be seized by any foreign power, but be ever preserved as the property of the republic. Secondly, that I have not proposed to open immediately a ship canal across the isthmus; because I have seen this project abandoned in other parts of Central America and Columbia, for it had to encounter almost invincible difficulties on account of its magnitude. Desirous of carrying into execution a very gigantic undertaking, a lesser, but still a grand one, has been neglected.

Convinced that it has been well and truly said that "*By grasping at too much, we often lose what is in our power,*" I have resolved to carry the latter into effect, without however renouncing my hopes of accomplishing the former. Although a communication by water will not be attempted for the present, this will infallibly take place when the isthmus shall be well known to all nations as forming a convenient centre for carrying on the commerce of the whole world; when the advantage of giving to this grand work all the perfection of which it is capable shall be duly appreciated, and when both sides of the line of transport shall be dotted with rich and populous cities, as will certainly happen in a few years.

Let this be enumerated among the acts of your Excellency's public life, and your name will not only belong to the glory of your country, but will be identified with the best interests of mankind, and immortalised by the most imperishable of monuments. The whole world will receive incalculable benefits; and what advantages will not accrue to America in particular, when the accomplishment of this undertaking shall make her the centre of universal commerce, giving a vast impulse to the elements of her territorial wealth and greatness, dormant as yet, and incapable of being developed from the little intercourse she at present enjoys with the splendour and industry of Europe.

I beg leave, Sir, to repeat that the mind is bewildered and loses itself when it attempts to grasp the beneficial results that must accrue to Mexico on the completion of this project, from the facility with which her native products will be exported, and from her becoming the emporium of the commerce of the world,—as also from the immense sums arising from duties and other contributions, paid, not by the inhabitants of her soil, but by foreigners, and from the great influx of population and capital to which it will inevitably lead.

May your Excellency, therefore, become the author of these great and numerous benefits to your country, by adopting the articles of my memorial, and thus acquire the most memorable and well-founded of titles to an illustrious and patriotic career.

Mexico, February 25, 1842.

JOS. DE GARAY.

Nº 2.

Edict ordering the opening of the Isthmus, with the Grants therein specified; and Contract between the Supreme Government and Don José de Garay.

(Stamp.)

In the city of Mexico, on the second day of March, in the year one thousand eight hundred and forty-three, I, the undersigned notary national and public, being in the office of the Secretary of State for Foreign Affairs of the Supreme Government of the nation, and in the presence of the said Secretary of State, Don José Maria Bocanegra, also Magistrate of the Supreme Court of Justice, he said: That His Excellency the President of the Republic, General of Division, Benemeritus of the country, Don Antonio Lopez de Santa Anna, in the exercise of the authority conferred upon him by the seventh clause of the Convention of Tacubaya, sworn to by the Nation, and by the Representatives of the several Departments of the Republic, was pleased to issue and cause to be published with due solemnity the following:—

EDICT.

“Antonio Lopez de Santa Anna, General of Division, Benemeritus of the Country, and Provisional President of the Republic of Mexico, to all the inhabitants thereof, know ye:

That firm to my purpose of aggrandising the nation and of rendering the people happy, having before me the propositions which Don José Garay has presented, and considering that no

means are so sure and effectual for promoting the national prosperity as that of making the Republic the centre of the commerce and navigation of all countries, and that this must be the consequence of the establishment of an easy and short mode of transporting effects from one ocean to the other ;—As nature offers the means of accomplishing this, without opposing any great obstacles in the way of it, and without the necessity of incurring any vast expenses, in the isthmus of Tehuantepec ; inasmuch as there the Cordillera dips or lowers itself to such a degree that it may almost be said to disappear, and that there are two harbours in those parts, one toward the north and the other toward the south, at a short distance from each other, a considerable portion of the space between them being easily transitable by means of a navigable river and lake, and the nature of the intermediate surface being very favourable to carrying on the works which it may be necessary to undertake, as it abounds in materials for construction ;—And considering that if up to this moment public attention has not been properly called to this enterprise (which alone is capable of aggrandising the Republic), it has, perhaps, originated in not having duly calculated the important consequences which must result from it, either because its execution has been deemed impossible, or that a prejudice existing in favour of making a cut through the isthmus to join the two oceans, the advantages of a railroad or canal destined for the transshipment of goods, by which the same results might be approximately obtained, has been entirely lost sight of ;—And furthermore desiring, if more cannot be done, to accomplish what is practicable when it is of importance to the Republic and to the world in general ; and seeking, by promoting the execution of what is at present attainable, to give an impulse to future attempts on a larger scale (for the opening of a line of communication, by tending to show that it is not difficult to cut across the continent, may hereafter conduce to the undertaking of this great work) ;—Feeling, besides, that in order to encourage the spirit of speculation, it is necessary to make concessions and confer privileges, by which alone enterprise has ever been fostered ; and that by this enterprise in particular the nation will obtain revenues with which it cannot reckon at present, paid by the commercial interests of other nations, and immediately reap the advantages which must result from universal intercourse, when its soil shall become the emporium of commerce, and consequently teem with

wealth and abundance, when its various products shall become articles of exportation ;—*Therefore*, by virtue of the powers and faculties vested in me by the seventh article of the convention signed at Tacubaya and sworn to by the Representatives of the Departments, I have determined to issue the following

DECREE.

Article 1. A line of communication shall be opened between the Pacific and Atlantic Oceans through the isthmus of Tehuantepec.

Article 2. This shall be performed by water, except where it is impracticable, when railroads and steam-carriages shall be used.

Article 3. The passage across the isthmus having been opened, it is declared hereby neutral and common to all nations at peace with the Mexican Republic.

Article 4. The execution of this work shall be confided to Don José de Garay ; to whom is hereby granted an exclusive privilege to this effect. His obligations and indemnifications shall be as follow :—

First. Don José de Garay shall cause to be made at his own expense a survey of the ground and direction which the route should follow, and also of the ports which may be deemed most commodious. All which shall be concluded at furthest within the space of eighteen months from the date hereof: and the works shall be commenced within the space of ten months next thereafter;—and in case this shall not be performed within the time specified, the exclusive privilege hereby conceded to him shall cease.

Second. The said Don José de Garay shall cause to be made in the ports which he shall select all kinds of works that may be necessary for shelter and utility. He shall construct in each of them fortresses and warehouses; he shall carry into effect the line of communication between the two ports by means of water-carriage or railroads, in both cases by means of steam; and he shall establish as many steam-boats and trains of steam-cars as shall be deemed necessary.

Third. The grantee shall pay at a just valuation for any private property through which the route shall pass; but he shall not occupy, on account of public utility, more than a quarter of a league on either side of the line which is all he can require the proprietors to sell.

Article 5. The indemnifications which are hereby accorded to

the grantee and to those who may acquire his rights, or any part thereof, are the following :—He shall have the right of collecting the passage dues for the term of fifty years, at the expiration of which time they shall revert to the Government of the Republic; and for sixty years the exclusive privilege of carrying on the transport by steam-vessels and railroad cars, with the right of determining an equitable rate of freight. But he shall give to the Government, from the time that the line of communication shall be opened for the transport of effects, the fourth part of the net produce of the receipts for this purpose, deducting the expenses of administration, preservation, and repair thereof. The Government shall also give a fourth part of the net profits to the Negotiation during a like term of fifty years, when it shall enter into possession of its before-mentioned rights over the line of communication. The Government and the Negotiation may each name their agents to look into the receipts and expenditures, during the whole of the time that each respectively shall be entitled to the before-mentioned fourth part of the profits. All the unoccupied lands for a distance of ten leagues on either side of the line of communication are hereby ceded in fee-simple to the Negotiation.

Article 6. All foreigners are permitted to acquire real property, and to exercise any trade or calling, not even excepting that of mining, within the distance of fifty leagues on either side of the line of transit. That territory shall be the country of all who may come to establish themselves there; subject, however, to the laws of the Republic.

Article 7. The Government engages to give to the Negotiation every protection and assistance, as well for effecting the survey as for carrying on the works; but the remuneration of the services of the inhabitants of those parts shall be at the expense of the Negotiation. The Government also engages not to impose any contributions or taxes upon travellers or effects *in transitu*, until the expiration of the aforesaid term of fifty years, and not to levy upon the Negotiation or its funds any imposts or forced loans.

Article 8. The Government shall have the right of appointing the custom-house officers which it may see fit in the ports and in any other points it may choose on the line of communication: but only for the purpose of recovering the duties of importation and exportation upon articles which do not come and go merely for the purposes of transport, and for preventing smuggling: and in no

case shall they interfere in the collection of transport dues, nor in the collection of freights, lighterage or tonnage, or of any other class of dues; for none shall be payable by vessels loading or unloading for the transport of effects as long as the communication shall belong to the Negotiation. The measures which the Government shall take for the prevention of smuggling shall be such as to cause no embarrassment or delay in the transport of effects across the isthmus, and particular regulations will be adopted and issued to this effect.

Article 9. When the works shall be completed, they shall be examined by two surveyors, one to be named by the Government, and the other by the Negotiation, in order that they may declare whether it has fulfilled the terms of the contract; and in case these shall disagree, they shall nominate an umpire who shall have the casting vote: but no kind of question or difference shall prevent the line of communication from coming into operation as soon as it shall be ready; and the Negotiation is always bound to fulfil the contract in every particular.

Article 10. In case it should hereafter be found practicable to join the two seas by a cut, and that propositions to this effect should be made by any individual or any company, they shall not be admitted during the period of fifty years for which the privilege is granted to Don José de Garay, without his previous consent or that of those who may have acquired his rights.

Article 11. The contract between the Government and Don José de Garay shall be drawn out in writing according to the tenor of the articles forming the basis of this decree, with all the formalities required by law.

Therefore I command that it be printed, published and circulated, and duly carried into effect. Given at the Palace of the National Government this 1st day of March, 1842.—ANTONIO LOPEZ DE SANTA ANNA.—JOSE MARIA BOCANEGRA."

(Continuation)

"That for the fulfilment of the preceding decree, and in accordance with the enactments of the Supreme Government, it was determined to draw up and execute the title-deeds to which it refers, effecting them in the best and most hindring form, and therefore he declares that in the name and with the power of the Supreme Government fully and extraordinarily authorised by the

before-mentioned seventh clause, and by its especial tenor, he grants to Don José de Garay the exclusive power of opening and constructing in the isthmus of Tehuantepec a communication between the Pacific and Atlantic Oceans, with the obligations, rights, and advantages contained in the pre-inserted decree, dated the 1st instant, conceding to him in full right of property and dominion all the waste lands in the isthmus within ten leagues on either side of the projected communication, granting him also the same right possessed by the nation of making use of the private property for objects of public utility, that he may acquire the grounds necessary for the transit, including a space of one-fourth of a league on either side, with due and previous remuneration to the proprietors according to valuation, and without regard to the increased value which the grounds may afterwards acquire in consequence of the projected works and the expenses incurred by the parties effecting the communication; and under no excuse whatever will the government lay any tax or impost upon any of the articles passing through the isthmus during the period in which the proprietors of the transit shall have the exclusive enjoyment of its proceeds, as well as the regulation of its tariff-rates, as mentioned in the seventh and eighth clauses. That in the name of the Supreme Government, and under the most solemn protests, he declares and promises that all and every one of the concessions mentioned in the preinserted decree shall be honourably fulfilled, now and at all times pledging the honour and public faith of the nation to maintain the projector, Don José de Garay, as well as any private individual or company succeeding or representing him, either natives or foreigners, in the undisturbed enjoyment of all the concessions granted, holding the National Administration responsible for any acts of its own or its agents, which from want of proper fulfilment of the covenant might injure the interest of the proprietors, all of course subject to the exact tenor of the inserted decree. And Don José de Garay, being also present, and whom I hereby certify I know, said that he had accepted, and again accepts, the above-mentioned contract, and solemnly submitted to all and every one of the conditions therein expressed, according to the tenor of the preinserted decree of the Supreme Government; and he willingly consents to forfeit the privileges granted to him, and whatever sums he or those who might succeed him should have advanced, if by any unforeseen event the line of communication

shall not be established; and he is also willing that the enterprise should be held bound to fulfil all that is here agreed upon. And his Excellency the authorised Minister of State and the same Don José de Garay, in their respective capacities, renounce any laws in their favour, and hold this as the most binding obligation, accepting and taking for granted any additional clause which might make it still more so.

It was so declared and signed by his Excellency the Minister, and also by Don José de Garay, and witnessed by Don Manuel Madariaga, Don Manuel Rojo, and Don José Mendoza, of this city: which I certify.—J. M. DE BOCANEGRA=JOSE DE GARAY=Francisco de Madariaga—Notary Public and National.

Engrossed duplicate at the request of Señor Garay, this nineteenth day of December, one thousand eight hundred and forty-three, in seven sheets, the first bearing the first stamp and the other the fourth.

Corrected: the same parties being witnesses: which I certify.

(*Signet.*)

FRANCISCO DE MADARIAGA,
Notary National and Public.

We, the undersigned, hereby certify that the citizen Francisco de Madariaga, by whom the above testimony is authorised, is a Notary National and Public of this capital, entire faith being always given to any document authorised by him. In testimony whereof we give the present, stamped with the seal of our college in the city of Mexico, this nineteenth day of December, in the year one thousand eight hundred and forty-three.

(*Signet.*)

MARIANO CABEZA DE VACA.

(*Signet.*)

MANUEL DE MADARIAGA.

(*Signet.*)

RAMON DE LA CUEVA.

Notary National and Public.

(*Seal*)

Colegio Nacional de Escribanos de México,
Año de 1843.—Peña.

Vu par nous consul Chancelier de la Légation de France à Mexico, pour legalisation des signatures ci-dessus des sieurs Manuel de Madariaga, Ramon de la Cueva, et Mariano Cabeza de Vaca, tous les trois notaires publics en cette Ville, Mexico, le 26 Décembre, 1843.

FRANÇOIS S. B. CHAMPEAUX.

(Seal.)

Légation de France au Mexique.

I, Ewen C. Mackintosh, Her Britannic Majesty's Consul in Mexico, do hereby certify unto all whom it doth or may concern, that Don Mariano Cabeza de Vaca, Don Manuel de Madariaga, and Don Ramon de la Cueva, whose signatures appear at the foot of the foregoing act of legalisation, are notaries public, duly authorised and practising in this city, and that to all acts and instruments of writing so legalised by them, full faith and credit are and ought to be given in judicature and thereout. In witness whereof I have hereunto set my hand and seal of office at Mexico, this twenty-sixth day of December, in the year of our Lord one thousand eight hundred and forty three.

EWEN C. MACKINTOSH,
Consul.

(Seal)

British Consulate.—Mexico.

I, the undersigned, Consul-General of H. C. M. in the Republic of Mexico, do hereby certify that the three signatures legalising that of the notary public Don Francisco de Madariaga, by whom the preceeding documents are authorised, are in the handwriting of the notaries national and public Don Mariano Cabeza de Vaca, Don Ramon de la Cueva, and Don Manuel de Madariaga who are entitled to full confidence and credit, the same which is always afforded to them both in or out of the exercise of their office.

In testimony whereof I hereunto put my signature and seal.

Mexico, the twenty-sixth day of December, one thousand eight hundred and forty three.

In the absence of the Consul-General Don Francisco Preto y Neto.

The Chancellor Vice Consul,
MARTIN LAPIEDRA.

(Seal.)

Consulado General de España
en la República de México.

No. 1618.—Consulate of the United States of America. Mexico, December 26, 1843.

I, the undersigned Consul of the United States of America, for the City of Mexico, hereby certify that the signatures of Mariano Cabeza de Vaca, Manuel de Madariaga, and Ramon de la Cueva, subscribed to the preceding document, are in the proper handwriting of said persons respectively, the same as used by them in all their official acts and deeds, who are all well known to me, and were at the time of subscribing the same duly authorised notaries public of this city, and that all their official acts are entitled to full faith and credit.

In testimony whereof I have hereunto set my hand, and affixed the consular seal, the day and year first above written.

JOHN BLACK.

(Seal.)

Vu par nous consul de S. M. le Roi des Pays Bas à Mexico pour legalisation des signatures ci dessus des sieurs Manuel de Madariaga, Ramon de la Cueva, et Mariano Cabeza de Vaca, tous les trois notaires publics en cette capitale.

Mexico, le 26 Décembre, 1843.

ADRIEN LESTAPIS,
Consul.

(Seal.)

Consulaat-Generaal der
Nederlanden te Mexico.

Nº 3.

Communication from Don José de Garay to the Supreme Government, thanking them for having accepted his proposals for the opening of the isthmus, stating at the same time, that in proceeding to the scientific exploration he considers it expedient that an officer of the engineer corps should accompany the civil engineers appointed to carry it into effect, and requesting that such an officer may be selected by the general staff corps.

MOST EXCELLENT SIR,

I, the undersigned, appear before your Excellency in order to offer my best thanks for having deigned to accept my proposals respecting the great work of a line of communication between the two oceans in the isthmus of Tehuantepec.

This undertaking which will be your Excellency's most glorious title, since you will obtain by it the heartfelt gratitude of the nation and the admiration of the world, has been entrusted by your Excellency to my zeal and solicitude. I faithfully promise that my activity will be proportionate to the magnitude and importance of the project.

I am actively preparing the scientific survey which is to be the basis of our labours; two hydraulic engineers will soon proceed to the spot to commence operations, and it would be highly desirable that an officer of engineers of acknowledged abilities should accompany them on their expedition, whom I beg your Excellency to order to be appointed by the general staff. I also request that your Excellency may be pleased to recommend the exploration, and order the necessary assistance to be afforded to the members of the Commission appointed, by causing the requisite orders to be issued to the military commanders and governors of the departments of Oajaca and Vera Cruz.

Deign, most excellent sir, to accept the expression of my gratitude and respect, and grant me this first assistance which I require.

Mexico, March 5, 1842.

JOS. DE GARAY.

To His Excellency, Don Antonio Lopez de Santa Anna, General of Division, Benemeritus of the country, President of the Mexican Republic.

N^o 4.

Official communication from General Valencia to Don José de Garay, transmitting the order of his Excellency the Minister of War and Marine upon the subject, and informing him of the appointment of Captain Don José Gonzalez.

General staff corps. Secretary's Office, 4th department.

In a communication dated the 5th inst., his Excellency the Minister of War and Marine says as follows :

MOST EXCELLENT SIR,

His Excellency the Minister for Foreign Affairs and the Home Department, in a communication addressed to me this day, says—“Most Excellent Sir, Don José de Garay having informed his Excellency the Provisional President that he has appointed two hydraulic engineers to perform the scientific exploration, which ought to precede the commencement of works for the opening of a communication between the two oceans across the isthmus of Tehuantepec which he has undertaken to perform, and expressed at the same time how convenient it would be that the two engineers should be accompanied by a scientific officer of acknowledged abilities, his Excellency desires that you should give the necessary orders to the commander of the general staff, that he may appoint an officer fitted for the purpose, and deserving of his confidence. His Excellency commands also that the necessary orders may be sent by you to the general commanders of Oajaca and Vera Cruz, that they may lend their assistance to the party performing the exploration, whenever Señor Garay shall apply to them in quest of assistance, as he may have occasion to do, and I have the honour to transmit this supreme command to your Excellency that it may be properly fulfilled on your part.”

I transmit the same for your information, observing that the individual appointed by this general staff is Captain Don José Gonzalez, who has been ordered to present himself to you for this purpose.

God and Liberty, Mexico, March 12, 1842.

GABRIEL VALENCIA.

Señor Don José de Garay.

Nº 5.

Official communication from his Excellency the Minister for Foreign Affairs and the Home Department to Don José de Garay, transmitting to him that of his Excellency the Governor General of the Department of Oajaca, in which he promises every assistance in his power to the enterprise for the oceanic communication, in accordance with the recommendation received to that effect.

Office of the Secretary for Foreign Affairs and Home Department.
In a communication, dated the 10th inst., his Excellency the Governor of the Department of Oajaca tells me as follows:

"MOST EXCELLENT SIR,

"Duly attending to the recommendation which your Excellency addressed to me in your official communication of the 5th inst., I assure you that every possible assistance shall be rendered to Señor Don José de Garay which he may require to attain the object he has undertaken of opening a communication between the two seas by the isthmus of Tehuantepec."

And I transmit it to you for your information.

God and Liberty, Mexico, March 14, 1842.

BOCANEGRA.

Señor Don José de Garay.

Nº 6.

Official communication from his Excellency the Minister for Foreign Affairs and Home Department, transmitting another from his Excellency the Governor of the Department of Vera Cruz, upon the same subject, and to the same effect.

Office of Foreign Affairs and Home Department.

In a communication dated the 10th inst., his Excellency the Governor of the department of Vera Cruz writes to me as follows:

"MOST EXCELLENT SIR,

"I have received your communication, dated the 5th instant, in which by command of the Provisional President you

desire me to lend every possible assistance to Don José de Garay in whatever he may require in his undertaking of opening a passage from sea to sea through the isthmus of Tehuantepec, and I have the honour to say in answer that this Government, duly appreciating the importance of the object in view, and fully convinced of the lasting benefits which its realization will necessarily confer on the Republic, and in the performance besides of their duty, will be most willing to lend every possible assistance in their power to the said Don José de Garay, with the zeal and promptness which the object demands and your Excellency recommends."

God and Liberty, March 16th, 1842.

BOCANEGRA.

Señor Don José de Garay.

Nº 7.

Communication from Don José de Garay to the Supreme Government, informing them of the departure of the Scientific Commission for the Isthmus, and soliciting that the Officer of the Ministry of Marine, Don Pedro de Garay, might be ordered to join it in the capacity of Secretary.

MOST EXCELLENT SIR,

I have the honour to inform you that the Scientific Commission entrusted with the exploration of the isthmus of Tehuantepec will depart from this capital on the 5th April next, and considering it convenient to add to that body in the capacity of Secretary Don Pedro de Garay y Garay, first officer of the Ministry of Marine, a gentleman deserving all my confidence for his integrity, industry, and knowledge, and in accordance with the 7th clause of the decree, dated the 1st instant, I beg that your Excellency may endeavour to obtain from his Excellency the Provisional President the necessary orders to the effect that the

said officer may be appointed to accompany the Commission for the term of four months, with his full salary paid by the Ministry of War and Marine to which he is now attached.

Mexico, March 28, 1842,

JOS. DE GARAY.

To his Excellency the Minister for
Foreign Affairs and Home Department.

Nº 8.

Official communication from his Excellency the Minister for Foreign Affairs and Home Department to Don José de Garay, transmitting to him the reply of his Excellency the Minister of War and Marine, in which his Excellency the President grants the preceding request.

Office of Foreign Affairs and Home Department.

I have received a communication, dated the 2nd instant, from his Excellency the Minister of War and Marine to the following purpose:

"MOST EXCELLENT SIR,

"His Excellency the Provisional President has been pleased to grant permission to the first officer of Marine, Don Pedro de Garay y Garay, to proceed with the Commission intended for the exploration of the isthmus of Tehuantepec, as solicited of the Government by Don José de Garay, in his communication inserted in your's of the 31st ultimo."

And I transmit it to you in reply to your communication of the 28th of last month relating to the subject.

God and Liberty, Mexico, 5th April 1842.

BOCANEGRA.

Señor Don José de Garay.

Nº 9.

Official communication from his Excellency the Minister of War and Marine, in answer to the Director of the Military College, wherein his Excellency the President desires that the Professor of Astronomy and Geodesy, Don Manuel Robles, shall proceed to assist in the exploration of the isthmus of Tehuantepec.

Ministry of War and Marine.—Section 4th.

His Excellency the President being informed of your communication of the 2nd instant, No. 39, concerning the salary which the Professor of the College, Don Manuel Robles, ought to receive whilst engaged in the exploration of the isthmus of Tehuantepec, and adding that on account of his absence the class of astronomy and geodesy in the said college must close, I am directed to say in answer to it that the Professor must take his departure as previously ordered, his salary being paid by the projector, and that another be proposed by you to superintend the class during his absence.

God and Liberty, Mexico, July 15, 1842.

TORNEL.

To the Director of the Military College.

Nº 10.

Communication from Don José de Garay to his Excellency the Minister of Foreign Affairs and Home Department, showing the progress of the work of exploration in the isthmus, and soliciting to be put in possession of the waste lands granted to him by the decree, dated the 1st of March 1842, the Supreme Government being pleased also to declare included in them all the concessions previously made of any part of the said grounds which may have been forfeited in consequence of the parties not fulfilling their contracts.

MOST EXCELLENT SIR;

I, Don José de Garay, projector of the line of communication between the two seas intended to be established in the isthmus of Tehuantepec, with due respect beg to submit to your Excellency

that in the fulfilment of my engagements to execute that undertaking, and in accordance with that which I made in the first part of article 4, of the decree of the 1st of March, 1842, since then committed to writing, I appointed and provided with every necessary means the Commissioners who investigated the locality, without sparing either labour or expense, which latter amounts already to a considerable sum. The results of this investigation are perfectly satisfactory, as your Excellency will see in the accompanying copy of the note which the secretary of the Commission addressed to me privately from the Venta de Chicapa, on the 11th of January last. The possibility of opening the projected communication is by these proceedings ascertained, a fact which cannot but be highly gratifying to the Supreme Government, so deeply interested in the execution of a work of the greatest importance to the aggrandisement of the Republic. My first engagement is therefore fulfilled. To fulfil the second, which must begin by marking out and opening the line of communication, levelling the ground, giving a different course to rivers, lakes, and creeks, and performing whatever is needful to realize the undertaking, the Supreme Government ought without delay to direct the civil authorities to place at my disposal the lands through which the road must pass from the bar of St. Francisco in the south, to that of Coatza-coaleos in the north, as well as of the uncultivated or unclaimed lands mentioned in the 5th article of the said decree. This last clause is essential to the realization of the third part of the 4th article, since without being able to commence immediate operations on hills, plains, and rivers, it will be impossible to fulfil the second part of my duties relative to the execution of the works.

The Supreme Government has seen the zeal with which I have attended to my engagements in the very fact of the investigation for which eighteen months were allowed having been performed in nine, notwithstanding the difficulties and drawbacks which the Commission had to encounter. It is the same spirit of activity and solicitude that urges me to make the above demand, especially as if, from want of the necessary orders, the Commission be needlessly detained a month longer, my expenses will be materially increased. According then to the above statement, and to the claims which my agreement gives me, I beg that the Supreme Government may be pleased to issue orders to put me in possession of the territory through which the works must be carried on, as well

as for the fulfilment of the 7th article of the above-mentioned decree of the 1st of March. I must, besides, call the attention of the Supreme Government to the circumstance that various portions of land on both shores of the river Coatzacoalcas, through which the line of communication must pass, having been granted to colonists, it is natural that they will allege their rights as proprietors against those I have acquired by my engagements. These colonists, however, having neither cultivated nor peopled the lands which had been ceded to them for such purposes, have according to the laws of the country lost their right to the property, a fact which I request the Supreme Government in justice to myself will make public by a decree, lest I be involved in disputes and litigations after the outlay of large sums.

Mexico, February 9, 1843.

JOS. DE GARAY.

To his Excellency the Minister
for Foreign Affairs.

Nº 11.

Official communication from his Excellency the Minister for Foreign Affairs to Don José de Garay, enclosing a copy of the orders given to the Governors of Oajaca and Vera Cruz, to place the untenanted lands at his disposal, and that every measure be taken to prevent his agents from suffering any obstacle in their operations.

Office of Foreign affairs.

Sir, I subjoin a copy of the communications addressed this day to their Excellencies the Governors of the Departments of Oajaca and Vera Cruz. = "Most Excellent Sir,—On the 1st of May of last year the Provisional President published a decree granting to Don José de Garay an exclusive privilege to open a communication between the Pacific and Atlantic oceans in the isthmus of Tehuantepec; ceding to him, by article the 5th, the possession of the untenanted lands that lay within ten leagues on each side of the projected road, and promising by

article 7 to render him every assistance in carrying on both the survey and the works. The survey is so far advanced as to allow of the commencement of the works and other operations, without which a project of such magnitude would be thrown into jeopardy, greatly to the detriment of the Republic. His Excellency the Provisional President having present these considerations and others which spring from the same decree, and wishing to render effectual the solemn promises made, has been pleased to direct me to inform your Excellency of the above, that your Excellency may give the necessary orders for the fulfilment of the 5th article of the decree, by which Don José de Garay is to be put in possession of the untenanted lands that lay within ten leagues of both sides of the line of road, requesting at the same time that your Excellency will do all in your power not only to render effective the grant of lands as far as your department is concerned, but also to give the assistance and protection promised by the Supreme Government to Don José de Garay, so as to remove every obstacle likely to prevent or retard the execution of the plan.

It is essential that the Commissioners and other agents employed in the opening of this road, which must extend from the bar of Coatzacoalcos in the north to that of St. Francisco on the south, should be protected against every thing that may prevent the performance of their duties, and in case any claims to ownership of lands should be put forth by private individuals, your Excellency will regulate your proceedings according to the obligation which the 4th article of the decree imposes upon Don José Garay. Full liberty must also be allowed him to give a different course to the river Coatzacoalcos and its tributaries, or any other rivers, or to lakes or creeks, to clear their borders and use the timber when not required to be felled on private ground.

To know how far it will be necessary to make use of private property, as well as to mark out the limits of the grant of territory awarded to Don José Garay in the above-mentioned decree, that gentleman is authorised to appoint land surveyors, who will be subject to no control but that of the officer whom your Excellency may be pleased to appoint and entrust with instructions agreeably to this order, and the attendance of the adjoining land-owners, whose measurement will fix and determine his right of claim to possession. In case any proprietor of land refuses to give

up his property in conformity with this decree, a valuation will immediately be set on foot, and according to it the land purchased for the undertaking.

The greatness of this enterprise merits every effort to promote its realization ; and it is with this object that I have the honour to transmit this communication from his Excellency the Provisional President, availing myself of the opportunity to assure your Excellency of my deep respect and consideration."

God and Liberty, Mexico, February 9th, 1843.

BOCANEGRA.

Señor Don José de Garay.

Nº 12.

Decree by which the Government declares that all the lands granted previous to the decree of the 1st of March, both to natives and foreigners, and which are neither tenanted nor cultivated, belong to Don José Garay.

Office of Foreign Affairs.

To their Excellencies the Governors of Oajaca and Vera Cruz.

[Copy.]—His Excellency the Provisional President has been pleased to publish the following decree :

NICOLAS BRAVO, General of Division, Benemeritus of the country, and provisional President of the Republic of Mexico, to all the inhabitants be it known :—That a grant having been made in favour of the undertaking to open a communication between the two oceans, through the isthmus of Tehuantepec, of the untenanted lands lying within ten leagues on both sides of the line of communication, which, according to the surveys already made must pass through the river Coatzacoalcas, and wishing to remove every obstacle which might prevent or retard the realization of the undertaking, I have deemed it necessary in

N

right of the faculties which the 7th article of the Convention signed at Tacubaya, and sworn to by the representatives of the various departments, awards to the Supreme Government, to declare the following :

All the grants of land made either to natives or to foreigners previous to the decree of the 1st of March, 1842, from among the untenanted lands mentioned in the 3rd article of the said decree, and which actually remain uninhabited and uncultivated, are comprehended in the concessions made in behalf of the undertaking for the communication of the two seas, therefore I do order this to be printed, published, and circulated for the purpose of being fulfilled.

Palace of the Government, Mexico, February 9th, 1843.

NICOLAS BRAVO.

J. M. DE BOCANEGRA, Minister for Foreign Affairs.

A true copy of the original document transmitted to the Governors of Vera Cruz and Oajaca, which I enclose to you for your intelligence.

God and Liberty, Mexico, February 9th, 1843.

O. MONASTERIO.

Nº 13.

Communication from Don José Garay, informing the Supreme Government that the survey of the isthmus was concluded, and that its results were perfectly satisfactory, as proved by the communication of Señor Moro.

Office of Foreign Affairs.

MOST EXCELLENT SIR;

I have the pleasure to inform your Excellency that the survey of the isthmus of Tehuantepec is finally concluded, and that its results are highly satisfactory to the Republic, which thereby feels the dawning of a hope of prosperity for the whole world rising from the communication of the two oceans, and

to your Excellency to whom is due the glory of this grand undertaking.

It would take too long to enter into the particulars of all that has been done in the course of the year spent in this investigation, and during which so many new hopes and fears threw now a bright and encouraging light, now a dim and disheartening shadow on the undertaking, commenced in defiance of so many obstacles, under the auspices of your Excellency. I shall soon present to your Excellency a statement of all that has been done, with maps and plans of localities, since the Commissioners are already on their way to Mexico. At present I shall only inform your Excellency that the engineer, Don Cayetano Moro, chief of the Commission, intends taking as a model the Caledonian canal of Scotland, on which navigate 32-gun frigates; that in an official letter of the 28th of last month he pledged his honour to the possibility of realizing the undertaking, and that with respect to his fellow-labourers he expresses himself as follows: "The exploration of the isthmus is now completely terminated, and its results fully answer the views of the Commission. I have no hesitation in announcing positively that there is a possibility of effecting the communication of the two oceans through a canal, fit to be navigated by vessels adapted to the commerce of Asia and Europe. I have reserved for this moment the pleasure really great of calling your attention to the merit of Señores Robles and Gonzalez, without whose co-operation it would have been impossible to realize the survey. The first is a gentleman of uncommon abilities, who, besides rendering himself generally useful, devoted his time more especially to astronomical observations. The second, active and well-informed, was my constant companion and coadjutor from the beginning of the works, and he who has suffered most to promote its fulfilment. In both I have had the most intelligent and active co-operators, and if a narrative of our labours should ever be published, it would afford me the greatest satisfaction to pay them publicly a tribute of esteem and affection, by stating all the efforts which they have made for the accomplishment of the undertaking. Both promise to do honour to their country." A great step is already taken, and soon all the particulars will be made known for the benefit of the friends of the public weal, and for the honour of your Excellency, who thus promotes it. Permit me, meanwhile, to recommend to your notice Señor Don Cayetano Moro, to whose talent and scientific accom-

plishments we are indebted for the happy results of the investigation, and which are the foundation of the grand enterprise whose realization we anticipate. I beg to repeat to your Excellency the professions of my deep respect.

God and Liberty, Mexico, April 11, 1843.

Most Excellent Sir,

JOS. DE GARAY.

To his Excellency the President of the Republic,
Don Antonio Lopez de Santa Anna.

Nº 14.

Official communication from the Minister for Foreign Affairs, acknowledging the receipt of the foregoing communication, which his Excellency the President perused with great satisfaction.

Office of Foreign Affairs.

His Excellency the Provisional President having perused your communication of the 11th inst., in which you inform him that the survey undertaken with a view of opening a road of communication between the Pacific and Atlantic Oceans has been satisfactorily terminated, directs me to inform you that he looks upon the labours of the Commission with the interest they deserve, and duly appreciates the zeal which you have exerted to attain the happy results we have so long desired. His Excellency anticipates much honour to the Republic and much credit to himself from this great undertaking if the operations mentioned by you in your communication and their necessary results be realised, and he waits for further intelligence and the plans and maps promised in order to obtain a clearer insight into labours so important, and as to their favourable consequences. I avail myself of this opportunity to reassure you of my deep regard.

God and Liberty, Mexico, April 20, 1843.

BOCANEGRA.

Señor Don José de Garay.

Nº 15.

Communication from Don José de Garay to his Excellency the Minister for Foreign Affairs, enclosing a letter from the Secretary of the Commission of Survey, announcing his return to the capital, and repeating the opinion already expressed by him on the possibility of opening the intended communication through the isthmus.

Office of Foreign Affairs.

MOST EXCELLENT SIR;

In a letter of the 18th instant the Secretary of the Commission of Survey writes as follows: "I arrived here yesterday with the Commission, who last year left this capital to explore the isthmus of Tehuantepec for the purpose of opening a communication between the two oceans, according to the decree of the 1st of March, 1842. My former note informed you of the favourable results of our labours in that part of the country, and nothing could be more gratifying to me than to repeat my opinion concerning the practicability of the undertaking, which will be ever memorable from the great good and the important changes it will effect in the destinies of the Republic. The Commission will now proceed to arrange the notes, observations, and plans, in which will be shown the project they have conceived, and they hope to discharge this part of their duty with all the exactness the great importance of the enterprise demands. It remains now for me to assure you that the chief engineer, Don Cayetano Moro, and Captains Don Manuel Robles and Don José Gonzalez, are worthy of the highest esteem for the indefatigable activity and zeal with which they applied their scientific acquirements to the attainment of our object; and the third member of the Commission, the navy officer, Don Mauro Güido, is no less praiseworthy for his kind disposition and constant attention to every charge committed to his care. Finally I beg to express my gratitude for the confidence placed in me when entrusted with this Commission, and to assure you that I have sought by every means in my power to justify your choice."

In enclosing this to your Excellency, that you may convey it to the knowledge of his Excellency the President, I deem it my duty

to call his attention to the merit and zeal displayed in the fulfilment of his office by the first naval officer, Don Pedro de Garay y Garay, Secretary to the Commission, whose ability, zeal, and devotedness are worthy of commendation. I have the honour to repeat to your Excellency my professions of respect.

God and Liberty, Mexico, April 22, 1843.

JOS. DE GARAY.

To his Excellency the Minister for Foreign Affairs.

Nº 16.

Answer of his Excellency the Minister for Foreign Affairs, to the above communication.

His Excellency the Provisional President of the Republic was much pleased with the perusal of your note of the 22d inst., in which you enclose that of the Secretary of the Commission of Survey, containing a reiteration of his opinion that it was possible to open a canal between the two oceans through the isthmus of Tehuantepec. His Excellency waits for the documents you have offered, in order to obtain a clearer idea of the investigation which has been concluded and of the great result we may anticipate from it.

I beg to reassure you of my consideration.

God and Liberty, Mexico, April 29th, 1843.

BOCANEGRA.

Señor Don José de Garay.

Nº 17.

Decree ordering 300 convicts to be placed under the direction of Don José de Garay to work in the projected canal.

Office of Foreign Affairs.

His Excellency the President has been pleased to issue the following Decree :

“ Antonio Lopez de Santa Anna, General of Division, Benemeritus of the country, and Provisional President of the Republic of

Mexico, to all the inhabitants be it known—That whereas the survey of the isthmus of Tehuantepec has been concluded, and the works to open a communication between the two oceans about to be begun, and it being my wish to assist the director by every means in the power of the Supreme Government, I, by virtue of the prerogatives allowed me by the nation, decree as follows :

“ Article 1. A convict-station shall be established with 300 convicts to be employed in the works of the canal.

“ Article 2. The judicial authorities of Vera Cruz and Oajaca shall send to the said station, all criminals sentenced to public works, until the number be completed.

“ Article 3. The director of the undertaking will clothe and victual these 300 convicts, and provide them with tools, on his own account.

Article 4. The troops necessary to guard the station shall be provided by the military force of the department where the said station may be established, and paid by the director of the undertaking.

And that this decree may be known, circulated, and fulfilled, I hereby order it to be printed.

National Palace of Tacubaya, October 4th, 1843.

ANTONIO LOPEZ DE SANTA ANNA.

J. M. de Bocanegra, Minister for Foreign Affairs.

I have the honour to communicate this decree to you for your information and guidance.

God and Liberty, Mexico, October 6th, 1843.

BOCANEGRA.

Señor Don José de Garay.

I do hereby certify that the foregoing are faithful copies of the original documents, which I returned to Señor Garay. And that this may be known, I give the present certificate in the city of Mexico, on the 23d day of October, 1843. Witnesses, Don Manuel de Madariaga, Don Manuel Roys, and Don José Mendoza, all resident in this capital.

(Signet)

FRANCISCO DE MADARIAGA,

Public Notary.

The undersigned, public notaries, do hereby certify that the citizen Francisco de Madariaga, by whom the foregoing certificate is legalised, is a public notary of this capital, and that full credit should be given him judicially and extra-judicially. And that this may be known where it may suit the parties concerned, we give this sealed with the seal of our college in the city of Mexico, on the 23d day of December, 1843.

(Signet)

NAZARIO FUENTES.

(Signet)

MARIANO CABEZA DE VACA.

(Signet)

JOSÉ LOPEZ GUAZO.

(Seal)

Colegio Nacional de Escribanos de México,
Año de 1843.—Peña.

Vu par nous Consul Chancelier de la Legation de France á Mexico, pour l'legalisation des signatures ci-dessus des sieurs Nazario Fuentes, Mariano Cabeza de Vaca, et José Lopez Guazo, tous les trois notaires publics en cette ville.

Mexico le 26 Décembre, 1843.

FRANÇOIS S. B. CHAMPEAUX.

(Seal.)

Légation de France au Mexique.

I, Ewen C. Macintosh, Her Britannic Majesty's Consul in Mexico, do hereby certify unto all whom it doth or may concern, that the signatures Don José Lopez Guazo, Don Mariano Cabeza de Vaca, and Don Nazario Fuentes, which appear at the foot of the foregoing act of legalisation, are in the proper handwriting of the said parties who are notaries public duly authorised and practising in this city, and that to all acts and instruments of writing, so legalised by them, full faith and credit are and ought to be given in judicature and thereout. In witness whereof I have hereunto set my hand and seal of office, at Mexico, this twenty-sixth day of December, in the year of our Lord one thousand eight hundred and forty-three.

EWEN C. MACKINTOSH,

Consul.

(Seal.)

British Consulate.—Mexico.

The undersigned, H. C. M.'s Consul in Mexico, do hereby certify that the three signatures which legalize that of the notary public, Don Francisco Madariaga, are in the handwriting of the public notaries Don Nazario Fuentes, Don José Lopez Guazo, and Don Mariano Cabeza de Vaca, to whose signatures full credit is given judicially and extrajudicially, and that this may be known unto all those whom it may concern, I put my hand to this, and seal it with the consular seal in Mexico, this 26th day of December, 1843.

In the absence of the Consul-General Don Francisco Preto y Neto,

Vice Consul, MARTIN LAPIEDRA.

(Seal)

Consulado General de España
en la República de México.

No. 1618.—Consulate of the United States of America.—Mexico, December 26, 1843.

I, the undersigned Consul of the United States of America, for the city of Mexico, hereby certify that the signatures of Mariano Cabeza de Vaca, Nazario Fuentes, and José Lopez Guazo, subscribed to the preceding document, are in the proper handwriting of said persons respectively, the same as used by them in all their official acts and deeds, who are all well known to me, and were at the time of subscribing the same duly authorised Notaries Public of this city, and that all their official acts are entitled to full faith and credit as such.

In testimony whereof I have hereunto set my hand and affixed the consular seal the day and year first above written.

JOHN BLACK.

(Seal)

Nº 18.

Decree granting to Don José de Garay the term of a year, according to his request, for the commencement of the works.

(Stamp.)

I, the citizen Francisco de Madariaga, public notary of this capital, do hereby certify and bear witness that a decree, signed

by his Excellency the Minister for Foreign Affairs, Don José Maria Bocanegra, was presented to me by order of Señor Don José de Garay, which is exactly as follows :

(*Supreme order.*)

Office of Foreign Affairs.

SIR;

His Excellency the President *ad interim*, whom I acquainted with your request, that the period prescribed in the decree of March 1842 for the commencement of the works in the isthmus of Tehuantepec should be postponed for the term of a year, has been pleased to determine in Council this day that the same shall be granted.

God and Liberty, Mexico, December 28, 1843.

BOCANEGRA.

Señor Don José de Garay.

This copy of the Supreme Order agrees with the original, which I have returned to the person who in the name of Don José de Garay presented it to me, which I hereby witness. And that it may be known to all whom it may concern, I give this in the city of Mexico on the 29th of December, 1843.

Witnesses, Don Manuel Madariaga, Don Manuel Rojo, and Don José Mendoza, of this city.

(*Signet*)

FRANCISCO DE MADARIAGA,
Public Notary.

We, the undersigned Public Notaries, do certify and witness that the citizen Francisco de Madariaga, by whom the foregoing certificate is legalised, is a public notary of this capital, and that to all his acts full credit is given judicially and extra-judicially. And that this may be known we give the present sealed with the seal of our College, in the city of Mexico, on the 29th of December, 1843.

(*Signet*)

MARIANO CABEZA DE VACA.

(*Signet*)

FERMIN VILLA.

(*Signet*)

JOS. LOPEZ GUAZO.

(*Seal.*)

Colegio Nacional de Escribanos de México,
Año de 1843. — Peña.

I, Ewen C. Mackintosh, Her Britannic Majesty's Consul in Mexico, do hereby certify unto all whom it doth or may concern, that Don Fermin Villa, Don Mariano Cabeza de Vaca, and Don José Lopez Guazo, whose signatures appear at the foot of the foregoing act of legalisation, are Notaries Public duly authorised and practising in this city, and that to all acts and instruments of writing so legalised by them, full faith and credit are and ought to be given in judicature, and thereout. In witness whereof I have hereunto set my hand and seal of office at the city of Mexico, this twenty-ninth day of December, in the year of our Lord one thousand eight hundred and forty-three.

EWEN C. MACKINTOSH,

(Seal.)

Consul.

British Consulate, Mexico.

Vu par nous Consul Chancelier de la Légation de France à Mexico, pour legalisation de la signature ci-dessus de M. Ewen C. Mackintosh, Consul de sa Majesté Britannique à Mexico.

Mexico le 29 Décembre, 1843,

FRANÇOIS S. B. CHAMPEAUX.

I, the undersigned, Vice-Consul of the Spanish Consulate in Mexico, acting for the Consul General, at present absent on public business, do certify that the three foregoing signatures are in the handwriting of the three public notaries, Don Fermin Villa, Don Mariano Cabeza de Vaca, and Don José Lopez Guazo, by whom that of Don Francisco Madariaga is legalised, and full credit is given to all their written acts both judicially and extra-judicially. In testimony whereof I have hereunto set my hand and Consular seal in Mexico, this 29th day of December, 1843.

The Vice Consul,

MARTIN LAPIEDRA.

(Seal.)

Consulado General de España en la
República de México.

No. 1020.—Consulate of the United States of America.—Mexico, December 29, 1843.

I, the undersigned Consul of the United States of America for the city of Mexico, hereby certify that the signatures of Fermin Villa, Mariano Cabeza de Vaca, and José Lopez Guazo, subscribed to the foregoing document, are in the proper handwriting of said persons respectively, the same as used by them in all their official acts and deeds, who are all well known to me, and were at the time of subscribing the same duly authorised Notaries Public of this city, and that all their official acts are entitled to full faith and credit as such.

In testimony whereof I have hereunto set my hand, and affixed the Consular seal the day and year first before written.

JOHN BLACK.

(Seal.)

Vu par nous Consul de sa Majesté le Roi des Pays Bas à Mexico pour la légalisation des trois signatures de Messieurs Fermin Villa, Mariano Cabeza de Vaca, et José Lopez Guazo, notaires de la dite ville.

Mexico, 30 Décembre, 1843.

ADRIEN LESTAPIS,
Consul.

(Seal.)

Consulaat General der
Nederlanden te Mexico.

SDN 645959



LONDON:

PRINTED BY C. WOOD & CO., FOFFIN'S COURT, FLEET STREET.



